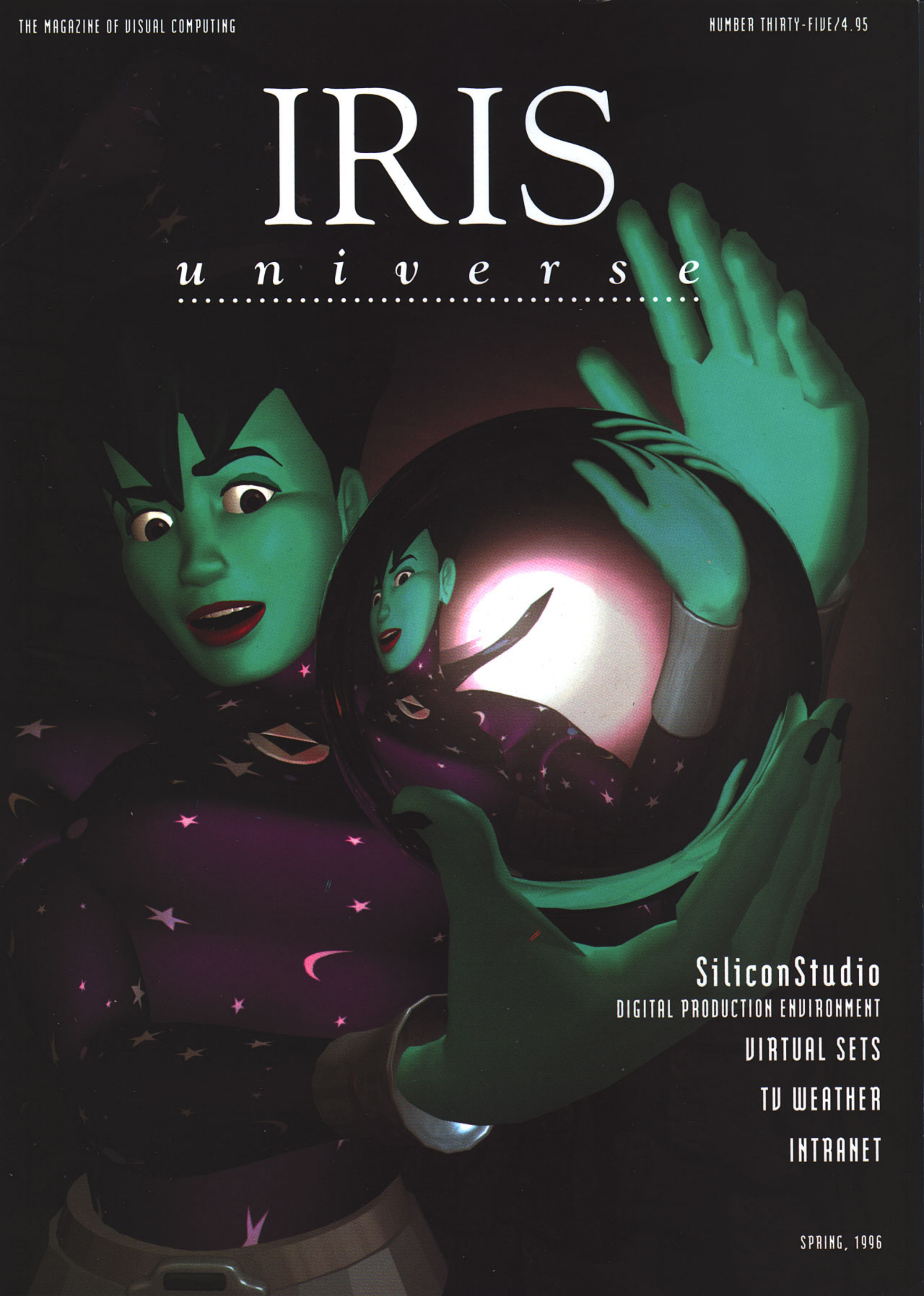
THE MAGAZINE OF VISUAL COMPUTING

NUMBER THIRTY-FIVE/4.95

IRIS universe



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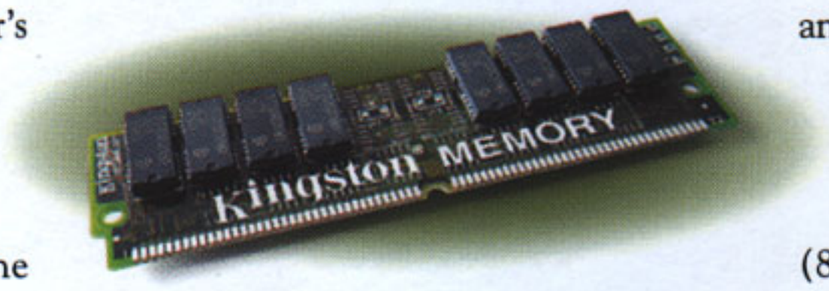

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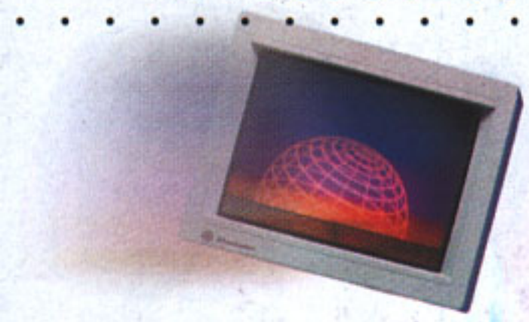

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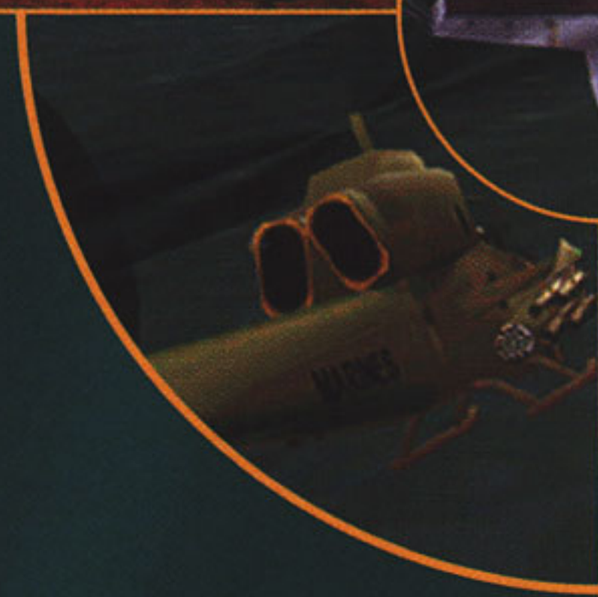

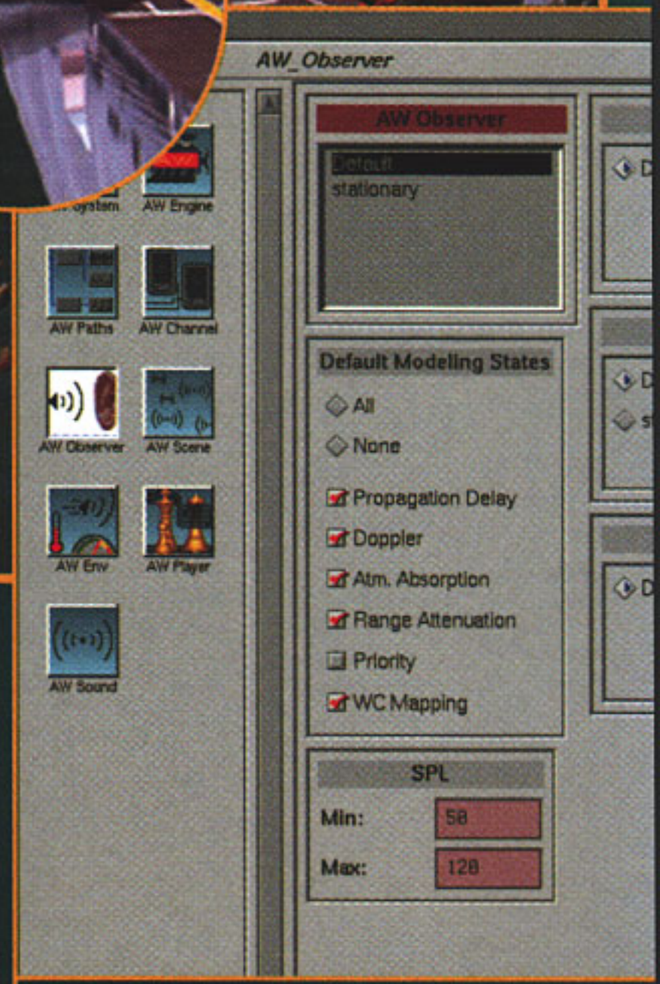

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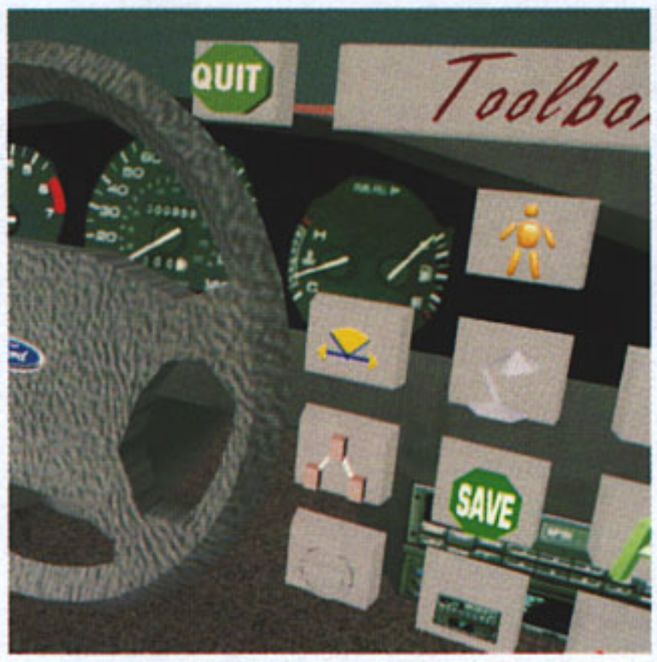

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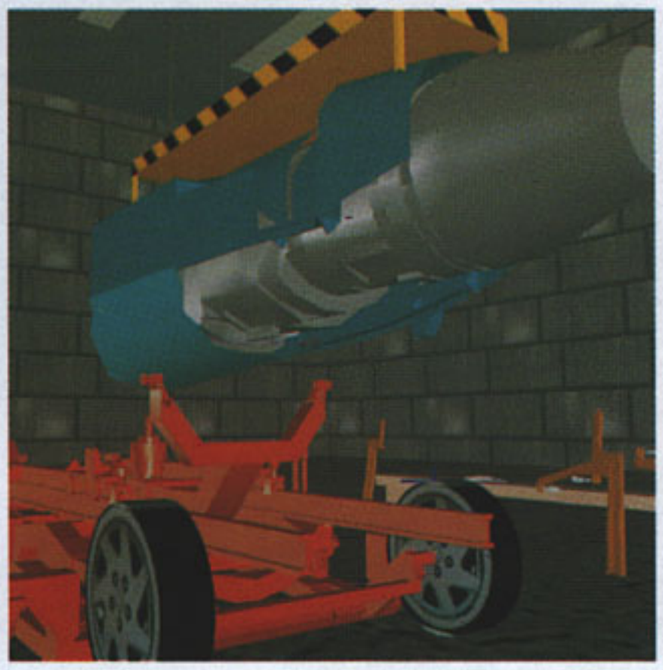

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ON THE COVER: ReBoot's irrepressible, workaholic femme fatale, Dot Matrix, plays sorceress.

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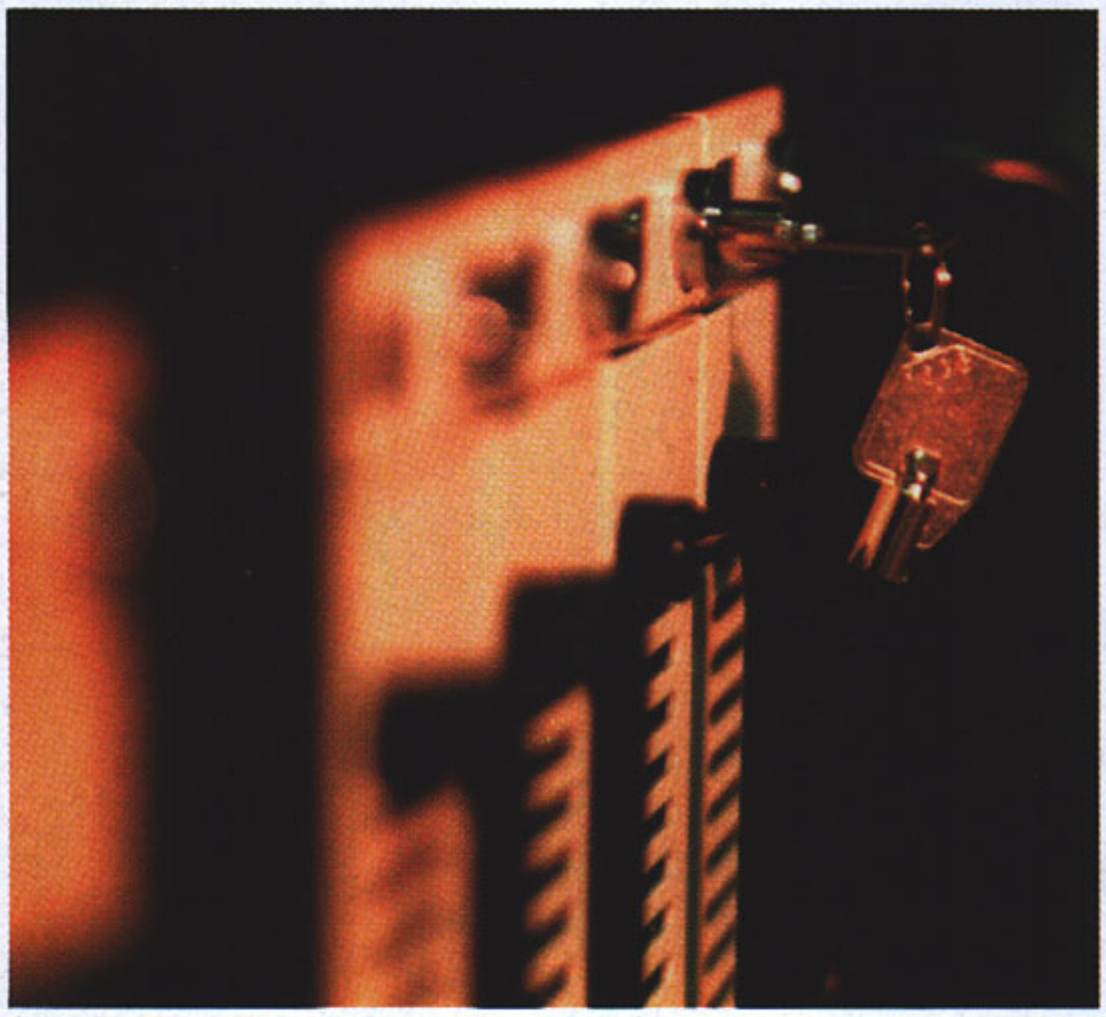

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KEYNOTE

The Times They Are A 'Changin'

Call it Visual Computing to the Higher Power—as Silicon Graphics technology transforms the world and *everything* goes digital. This special issue of IRIS Universe tunes in to our future world.

It's Plato's dream come true. Jonathan Luskin takes us into the virtual reality CAVE at the National Center for Supercomputing Applications to see the universe recreated in *Cosmic Voyage*, a film that honors the 150th anniversary of the Smithsonian Institution.

Everyone's turning blue! Ken Siegmann talks to early adopters of virtual set technology about their trials and tribulations bringing computer-generated realities to network news.

You say you want a revolution? Douglas Cruickshank takes us inside two strategic companies to show how the intranet (World Wide Web technology used for internal corporate communications) is changing the way that companies like Silicon Graphics and Eli Lilly and Company do business.

Don't it always seem to go that you don't know what you've got 'til it's digital? Lorne Falk takes us into the brave new worlds of digital artists Christa Sommerer and Laurent Mignonneau whose ground breaking interactive installations have a worldwide following.

You may not need a weatherman to know which way the wind blows, but how can anyone resist a ride through the clouds above our cities? Virginia Coyne tells us how TV meteorologists are using Earth surveillance data to bring detailed visualizations to the nightly news.

Space is the place—in this case, the *space* inside a computer. See our IMAGES gallery for stills from the clever cartoon, *ReBoot*, that has kids and adults tuning in Saturday morning.

The big wheel keeps on turning as Silicon Graphics continues to generate high-end technology that's changing the way we work, our society, and our culture. This issue of IRIS Universe features the power of the people who use the technology.

Wendy Govier, Executive Editor

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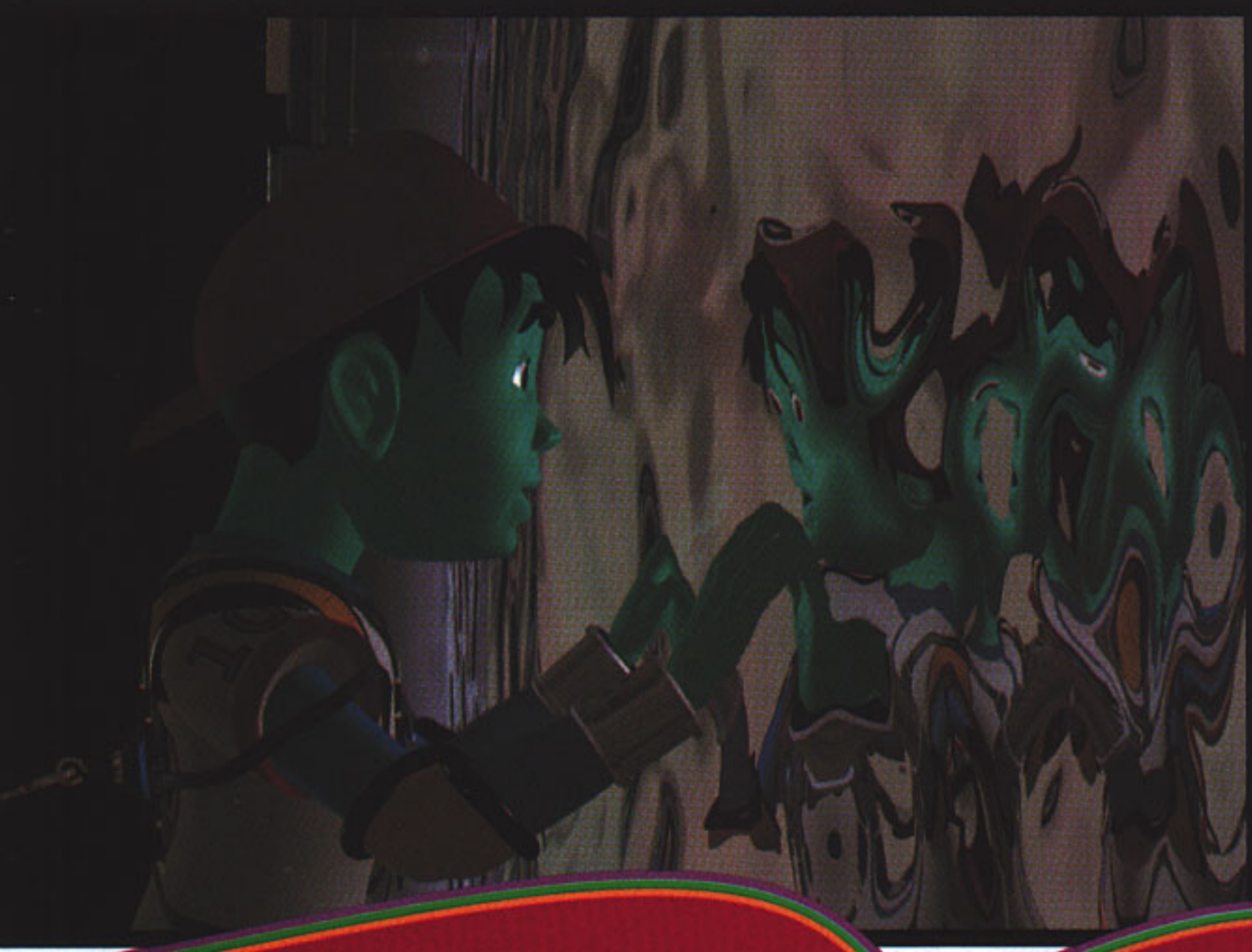


A 3D animated TV show takes kids inside a computer—literally!

ReBoot

If you haven't seen TV's hottest Saturday morning cartoon—tune in to ABC at 10:30 AM (EST) for a glimpse of *ReBoot*. The show, which hails from Canada, is the first weekly animated series to be produced entirely by computer.

ReBoot is set in the digital future where all the action takes place inside a PC—in a multilevel city called Mainframe. The main characters, robotic-looking "binomes" and human-like "data sprites," are on a mission to protect Mainframe from electronic invaders. The two evil characters, Megabyte and Hexadecimal, are computer viruses programmed to destroy Mainframe.

Thirty-some animators at *ReBoot's* production facility in Vancouver, British Columbia, create about 600 minutes of computer graphics for each season using Silicon Graphics workstations and SOFTIMAGE software. The first episode, which aired in September of 1994, took 18 months to animate. Now they can create two episodes in six weeks—up to two whole minutes of completed animation per day. It takes another 200 hours to customize the sound for each episode.

ReBoot has a huge following in Canada where it airs three times a week on YTV. The show is now influencing children worldwide and has a cult following in the U.S. where it appeals to kids, adults, and sophisticated technophiles who enjoy the high-tech jargon. It also airs in the

Binos—proletarian denizens of ReBoot.

Bob, Dot Matrix, Enzo Matrix, and Frisket the dog.

The notorious Megabyte.

The entire ReBoot crew.

U.K., and broadcast rights have been sold in more than 50 countries.

And there's more! *ReBoot's* parent companies, Alliance Communications and BLT Productions, have also issued more than 80 *ReBoot* licenses worldwide, and expect a dramatic increase in licenses as the series continues to expand. Partnerships are in the works with Electronic Arts for interactive games, PolyGram Video International for home videos, and with Irwin Toy Limited for action figures.

ReBoot has been showered with accolades: a Gemini Award for Best Animated Series, the 1995 Award of Excellence, and Best Animated Program from the Alliance for Children and Television.

—David E. DiNucci

Hexadecimal, Queen of chaos and malfunction.

Virtual Sets

The future acts itself out against a blue screen— as early adapters of the virtual set technology pioneer a broadcast revolution.

By Ken Siegmann

If you were watching the John Stossel news special on CBS last summer, you saw Stossel step out from behind a monolith and into a large room with a tiled floor and slanted glass walls. Then the newscaster moved upstairs to another large room with dark walnut walls that had video panels embedded in them. Through the window, you could see a pedestrian mall on the street below.

If you were in the studio during the taping of the *Common Sense with John Stossel* special, you saw none of that. You only saw Stossel walking through a blue cube—no walnut walls, no monolith, no tile floor, no mall.

Stossel was on a virtual set. Instead of moving through a traditional set of wood and nails, Stossel moved through an empty space, surrounded on three sides by a blue screen. He stood at spots that had been marked on the floor where the scenery otherwise would be, pointing to things that he couldn't see, but that the viewers could see on their television sets at home.

The actual set that TV viewers saw was created by a Silicon Graphics Onyx RealityEngine^2 supercomputer, using Reality Tracking software from ELECTROGIG of San Francisco to create a virtual environment that looked like the real thing to television viewers.

The John Stossel special was CBS' first trial with virtual set technology. It was a mixed success, but the prospect of virtual sets nonetheless has CBS designers and technicians excited.

Capital Cities/ABC was a little more cautious in its first trial. They didn't go on air with it, but ABC technicians and creative personnel constructed a 20-foot-by-40-foot blue cube, one of the largest blue cubes that anyone had ever seen, to test this new technology and show the results to excited producers and directors.

The virtual set, the buzz of the NAB show last year, is the central attraction again this year. It represents a new use for imaging technology that is right on the cusp of turning into an off-the-shelf reality. Broadcast and production executives are also excited about it. But at this early stage of the technology, there is still a debate as to whether it's really ready for prime time.

"The good news is we're on the cutting edge, and the bad news is we're on the cutting edge," says Barry Zegel, director of technical operations for ABC. "I think it's going to happen and it's very exciting. It's just not one-hundred percent there yet, but I don't think it's far off."

Nonetheless, the excitement is real, because as the technology improves the possibilities are virtually endless. Sets can be constructed so that they include animated characters or moving furniture. Objects can disappear and then reappear in a different location. Props can rise out of the ground. People can appear in all types of settings, from diamond-studded walls with gold inlay to the bottom of the ocean and the farthest reaches of outer space.

The people behind the virtual set technologies say they have learned a lot from the trials at CBS and ABC. And even they admit that their technologies have yet to become turnkey products that broadcasters and producers can easily install and use. Nonetheless, virtual sets are beginning to catch on, especially in Europe, where broadcasters are involved in the construction of a new broadcasting infrastructure and are quickly embracing new technologies. The number of virtual set installations worldwide has grown from five last year to 20 today. Most of them are in Germany.

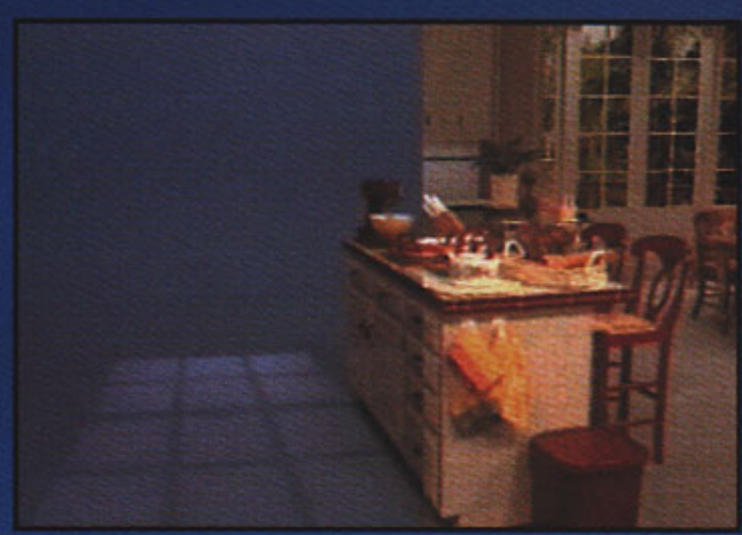
Virtual set systems are designed to give set designers and software engineers the ability to create real-time computer-generated 3D environments in which actors and cameras can move freely. Rather than acting in a physical set, actors move around in a blue matte cube in front of the cameras. The cameras are equipped with special encoders, which are connected to a Silicon Graphics Onyx supercomputer. Onyx tracks all camera movements, including lens focus and zoom, the movement of the camera head and dolly position, in real time. The computer then integrates the information from the camera with a preloaded virtual set and renders the set on-the-fly as the actors move around.

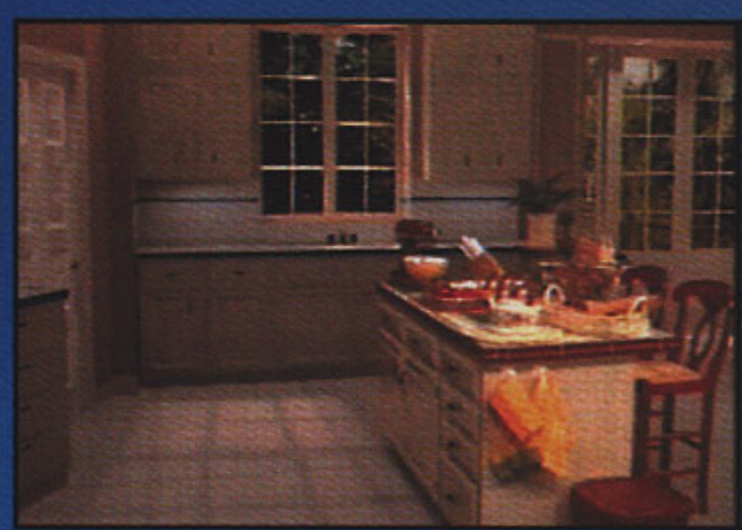
Virtual set enthusiasts cite numerous selling points for the new technology. They note that physical sets are expensive to build, transport, and store. Virtual sets can be stored on a disk drive or on a DAT tape instead of in warehouses. And with virtual sets, producers can make changes more quickly than ever before.

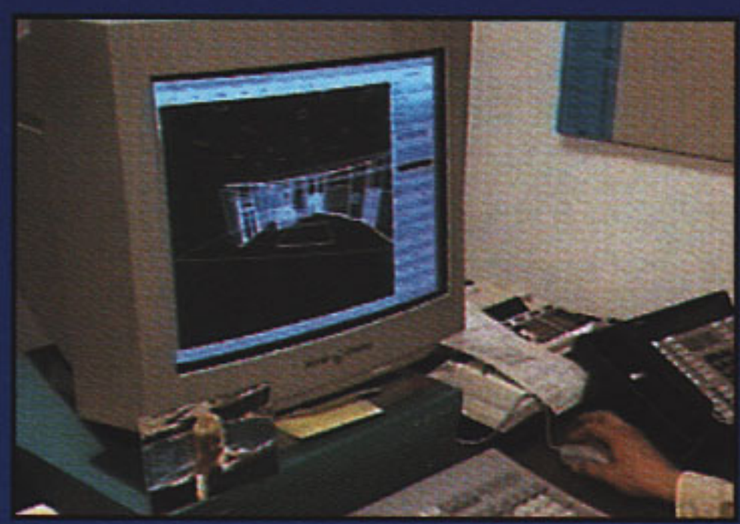
"The advantage is that you can create totally new rooms that would otherwise be extremely expensive to build," says Weidke Brendt, a producer with Bavaria Film Gmbh in Geiselgasteig, Germany, which uses virtual sets to produce a weekly news magazine, called *Focus TV*. "You can have a TV show in one studio and then another show in the same studio two hours later, because changing the set only takes two seconds. This is just the beginning."

But enthusiasm for virtual sets varies depending on who you talk to. Opinions differ over whether the technology to produce virtual sets has matured to the point where it can become a regular tool for many producers.

The most widespread and enthusiastic use of virtual sets is taking place in Germany, where the technology was first developed. Virtual sets were first demonstrated in 1992 by a small graphics and titles company in Hamburg, called IMP, which primarily produced graphics and titles for German sports programs. IMP went on the air with a virtual set for the first time in 1994, during the half-time interval of a national soccer match. Viewers saw an announcer standing in a soccer stadium, surrounded by scores and statistics, when in reality he was standing in a blue cube, set up in a small trailer near the stadium. Since then, Germany has led the implementation of







virtual sets. Last year, Discreet Logic of Montreal acquired IMP's virtual set technology. Discreet's Vapour 3D rendering and camera tracking program is emerging as the standard in Germany.

There are other reasons why virtual sets are catching on more quickly in Germany than elsewhere. Germany is in the midst of a major expansion of its broadcast infrastructure, as new commercial broadcasters are emerging from what was once a primarily government-controlled business. As a result, German broadcasters are more willing to experiment with new technologies as they are constructing facilities, rather than having to face the burden of integrating the new and complex technologies into existing facilities.

And there's an aesthetic difference of opinion. The German programs look as if they are using computer-generated sets, which apparently doesn't bother German producers. "people are more open about it because it's new," says Berndt of Bavaria Film.

But U.S. producers say that's not good enough yet. They demand realistic-looking sets and they complain that the amount of processing power that's currently available isn't enough to provide everything they want.

"With a physical set, you can put whatever you want on the set," says Mercedes Babbit, electronic graphics manager for CBS. "But on the virtual set, you're limited to the number of polygons you can put into the system and that limits what you can do on the set."

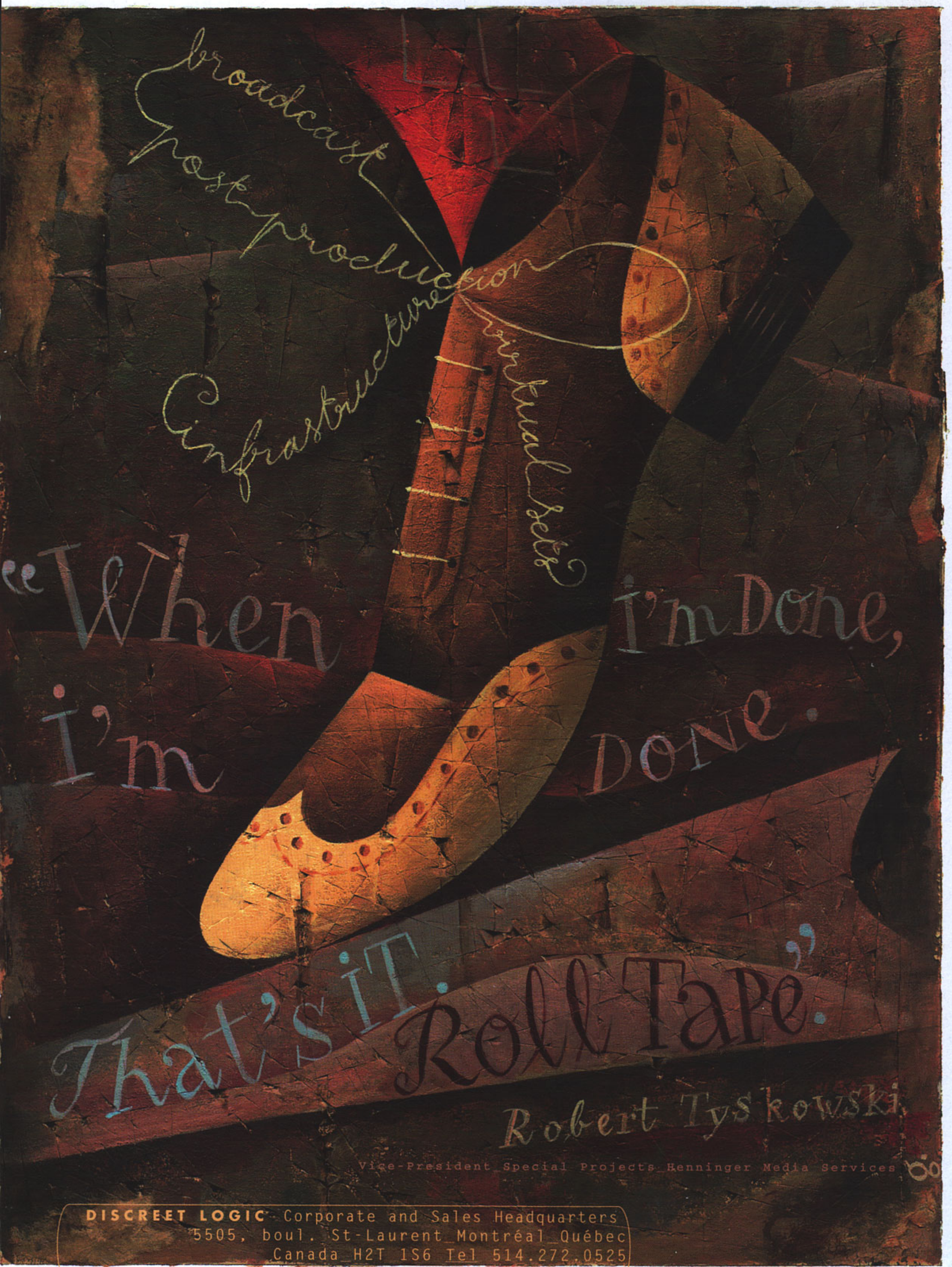
For example, during the John Stossel special, CBS producers wanted to have him standing next to a popcorn machine for segment on the fat content of popcorn. They didn't have enough computing power to keep him in the virtual set and produce a realistic-looking popcorn machine, so they wheeled out a real popcorn machine as a prop.

During the ABC trial, designers created a room with a jacuzzi and a fireplace. But because of the polygon count, they had to forgo fire in the fireplace and water in the jacuzzi.

System providers say the performance problems are temporary. In January, Silicon Graphics introduced Onyx InfiniteReality, the world's fastest visualization supercomputer. In fact, it's 100 times faster than the previous model, the RealityEngine^2.

"One of the key barriers has been that people in the industry expect higher performance from Onyx," says Dave Larson director of emerging markets for Silicon Studio, Inc., the Mountain View, Calif., subsidiary of Silicon Graphics. "The higher-performance InfiniteReality Onyx supercomputer will eliminate some of those technical barriers."

But there lies another barrier to widespread acceptance of virtual sets—money. Onyx InfiniteReality, with two high performance R10000 processors, starts at $209,000. A complete virtual set system costs between $1.5 million and $2 million.



And if studios want system redundancy, that means a second Onyx supercomputer, which further escalates cost.

That's a lot of money, even for the large broadcast outlets, like ABC and CBS. And it puts the technology essentially out of reach for the smaller, regional television operations.

"For people to really see widespread acceptance, it has to cost a half a million dollars or less," says Michael Dilworth, ELECTROGIG president and CEO.

One group of entrepreneurs in New York City is offering a solution to the high cost of virtual set production. Last year a small group of engineers, some of whom were involved with the Stossel show, started Virtual Studios Corp., in partnership with the Manhattan Center Studios, to offer virtual set facilities to producers who want to try the concept, but don't want to put up millions of dollars for it.

"We looked at this and saw an untried and untrue technology that is very expensive," said Gary Attanasio, Virtual Studios vice president and general manager. "Although there's a lot of sex appeal, not many producers are willing to plunk down a couple of million dollars on untested technology. So we decided to create a medium that allows directors and producers to check it out and feel safe at the same time."

Virtual Studios and Manhattan Center Studios built a graphics studio with three Onyx systems, 24 Silicon Graphics Indigo workstations and software from Acomm, ELECTROGIG, and Discreet Logic. Plus, they're using Alias|Wavefront and SOFTIMAGE software.

The last problem, one that even such dedicated folks as Attanasio is having trouble solving, is also a career opportunity.

"Because it's so new, there are no experts in the field," he says. "There's nobody that is really versed in it."

In addition to the technical training necessary, virtual sets will require artists and designers to think more differently about set designs than ever before.

"It's going to be a generational thing," says ELECTROGIG's Dilworth. "It will require a whole new set of professionals, from the talent who has to become comfortable working with blue screens to the set designers who have to learn to work with digital tools. It's a new paradigm."

That's both bad news and good news. The training period may indeed inhibit the speedy acceptance of virtual sets, but as that curve flattens, producers will be able to build sets, the likes of which they have barely dared to imagine.

"This is where it's all heading," says CBS' Zegel. "We have to learn to embrace it. It's exciting." ★

Ken Seigmann is a freelance author living in Sunnyvale, California, specializing in high-tech issues.

All images courtesy of CBS.

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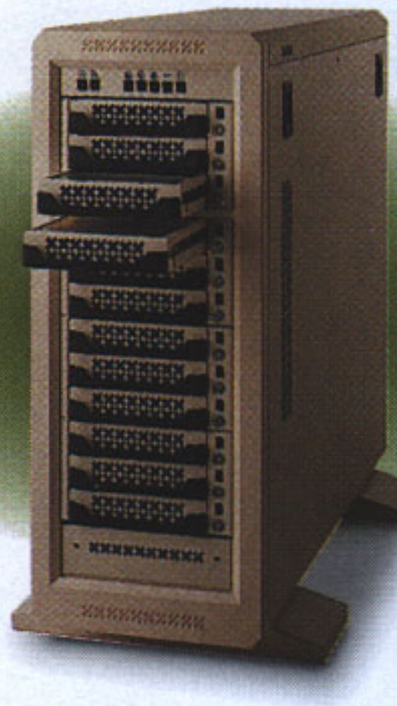

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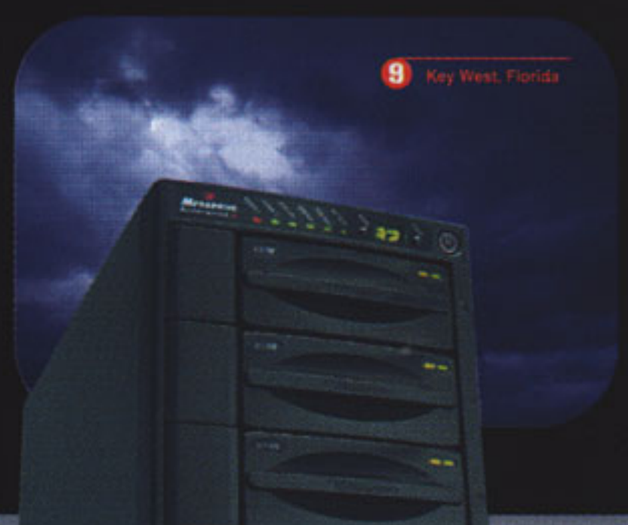

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EARTH

Rendered views of Chicago skyline with EarthWatch's Virtual Skies, texture mapped imagery of the real sky overhead.

Close-up views of Chicago's famous architecture shows how EarthWatch's Virtual Skies maps in actual weather footage. (Hancock Building shown here.)

Visual Computing Transforms Television

By Virginia Coyne

When the Blizzard of '96 paralyzed the northeastern United States in early January, meteorologist Jeff Mendelsohn of WCBS-TV in New York City was glad he didn't have to resort to "boring radar loops" to explain the intensity of the storm. Instead, with no artistic background at all, Mendelsohn created a weather simulation that actually flew New Yorkers underneath clouds and through the falling snow. His meteorological training, a powerful Silicon Graphics workstation and a user-friendly weather software system called EarthWatch were all he needed to create this virtual "fly-through" that no other local station was able to match.

The dynamic technology of Silicon Graphics and EarthWatch is transforming TV weather—bringing 3D animation to weathercasts that can give viewers a "space shuttle" perspective of the earth or even take them into the eye of a hurricane.

EarthWatch, the tool that sets TV meteorologists apart from their competitors, is a family of weather software systems. Depending on the software, meteorologists can access 3D terrain maps of the entire world, cloud coverage imagery from the GOES-8 satellite, or almost any weather icon imaginable. Another software option allows users to activate line data of major roads, counties, states, even rivers and streams.

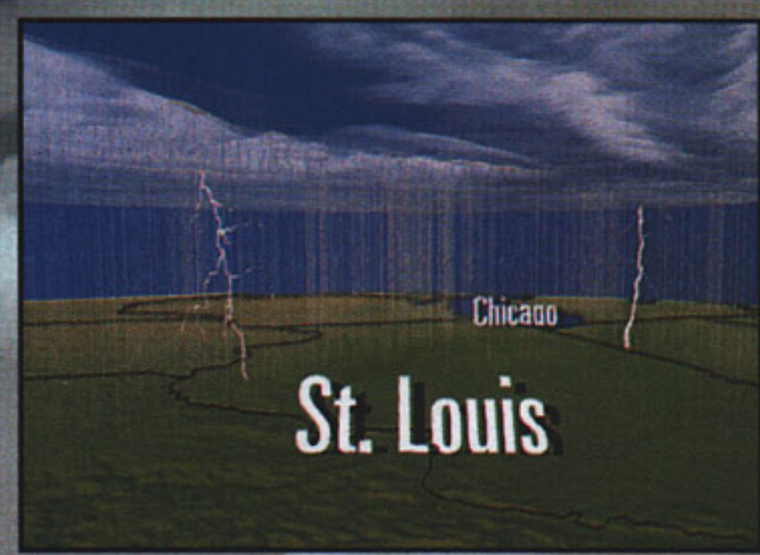
"Every other weather system on the market is two-dimensional, but weather is a three-dimensional science," said meteorologist Bill Henley of WCAU-TV in Philadelphia. "EarthWatch restores the third dimension." According to Henley, flat maps and radar loops used by most meteorologists only allow viewers to see the weather in their area, but not to understand the full picture.

Henley uses EarthWatch to show the origin of weather patterns. The week after the blizzard, for example, he forecast rain would hit Philadelphia in a matter of

WATCH

Left: Earthwatch's 3D weather image of the Midwest.

Right: EarthWatch merges real cloud and radar data from the National Weather Service to create a virtual view of lightning strikes.



Left: 20-meter resolution image of downtown Chicago. *Courtesy: SPOT Corporation.*

Right: A television station's weather talent can interact with the weather, with a EarthWatch's Virtual WeatherSet.

Weathercasts into Exciting 3D Landscapes.

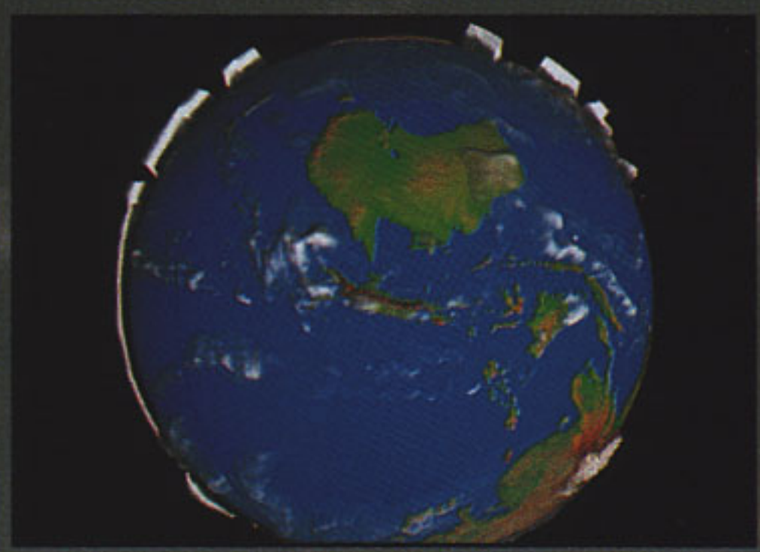
days. To explain, he "flew" to the West Coast and showed how a storm causing rain in California would move across the country and affect his region by the end of the week. "I don't think any other computer besides Silicon Graphics would be able to let me do this," said Henley.

To create a "fly-through," a meteorologist first decides what he wants to show, then enters coordinates for the first and last frames into his Silicon Graphics computer. The Silicon Graphics workstation renders all the images in between, producing a seamless animation. Other EarthWatch software options allow a meteorologist to fly over a 3D city model, or travel through clouds above—all with basic mouse commands.

The technology has transformed not only the way weather casts look, but the way meteorologists work. Forecasting is still a big part of their job, but now weather forecasters can select and process detailed weather data into a visual format that educates viewers in new ways about weather dynamics. As meteorologist Steve Rambo of Los Angeles' KCBS-TV [http://www.kcbs2.com/] says, "EarthWatch puts people in the weather, in a way they can understand."

When Rambo arrives to work, he first checks the last 24 hours of GOES-8 satellite data that his EarthWatch system receives every half hour. He then sets up the three to four separate views he wants to show, and uses his Silicon Graphics workstation to render the 95 to 200 frames in between. The resulting images show how the cloud coverage has changed in the last 24 hours.

EarthWatch also facilitates a faster response to late-breaking news—such as a tornado that hits during prime time—via the company's StormWatch software, which works even when the weatherman is not there. StormWatch uses raw data from satellites, ground-based stations, and the NOAA [http://www.noaa.gov/]



EarthWatch Reality image, powered by Silicon Graphics Indigo² IMPACT workstations, featuring texture-mapping and real-time capabilities, shown here with GMS-5 cloud imagery.

Images of the San Francisco Bay Area. At left, a 20-meter resolution image of the Bay, by SPOT Corporation. At right, a helicopter perspective, created instantly using EarthWatch software.

These EarthWatch images, showing cloud movement over the U.S., were created from GOES-8 weather satellite data, which is captured every 15 minutes.

Weather Wire to continuously monitor a specific area for severe weather. The instant a warning or watch is issued, the keyboard beeps until someone hits the enter key, an action that initiates a text crawl warning across the screen. StormWatch also allows for the display of graphical county information.

Faster reaction means higher ratings, to which WCAU-TV News Director Steve Doerr can attest. "With EarthWatch, we have seen a significant increase in ratings, especially on severe weather days," said Doerr. According to Doerr, EarthWatch allows his meteorologists to explain the weather more effectively and accurately than competing stations.

New interfaces and software coming this year will make EarthWatch even more visually exciting and easier to use, according to EarthWatch founder and president Paul Douglas. Douglas, who's also a meteorologist and EarthWatch user at WBBM-TV in Chicago, emphasizes that Silicon Graphics will continue to be the technology that takes EarthWatch to the next level. "We only run our software on Silicon Graphics," said Douglas. "It is the Ferrari of graphic computers." The difference between Silicon Graphics and a Ferrari, however, is that Douglas has found a way to bring Silicon Graphics/EarthWatch technology to even small market stations that would normally not be able to afford the technology. Stations can get the basic EarthWatch software and a Silicon Graphics workstation for less than $30,000.

The Silicon Graphics hardware varies according to the EarthWatch software. The popular EarthWatch 2000, for example, creates 3D imagery that can be aired "live" using RAM memory, or rendered frame by frame to videotape using V-LAN technology. EarthWatch 2000 runs on the Silicon Graphics Indigo² XZ 4400 with a 160MB RAM memory.

Even the entertainment industry has taken notice of the Silicon Graphics-EarthWatch team. When the rock group the Grateful Dead needed an exciting opening to a concert in Chicago's Soldier Field, it turned to EarthWatch's 3D Chicago skyline. Director Steven Spielberg used EarthWatch imagery in the 1993 blockbuster motion picture *Jurassic Park* and will use it again in the upcoming Warner Bros. [http://www.warnerbros.com/] movie *Twister*. The film is about two teams of tornado chasers, one of which uses cutting-edge technology to track the twisters. I'll let you guess where the EarthWatch technology comes in.

For more information see EarthWatch's home page at http://www.earthwatch.com/ ★

Virginia Coyne is Senior Producer of News in Motion, a news animation service of Knight-Ridder/Tribune. She lives and works in Washington, D.C Email: VCOYNE @aol.com

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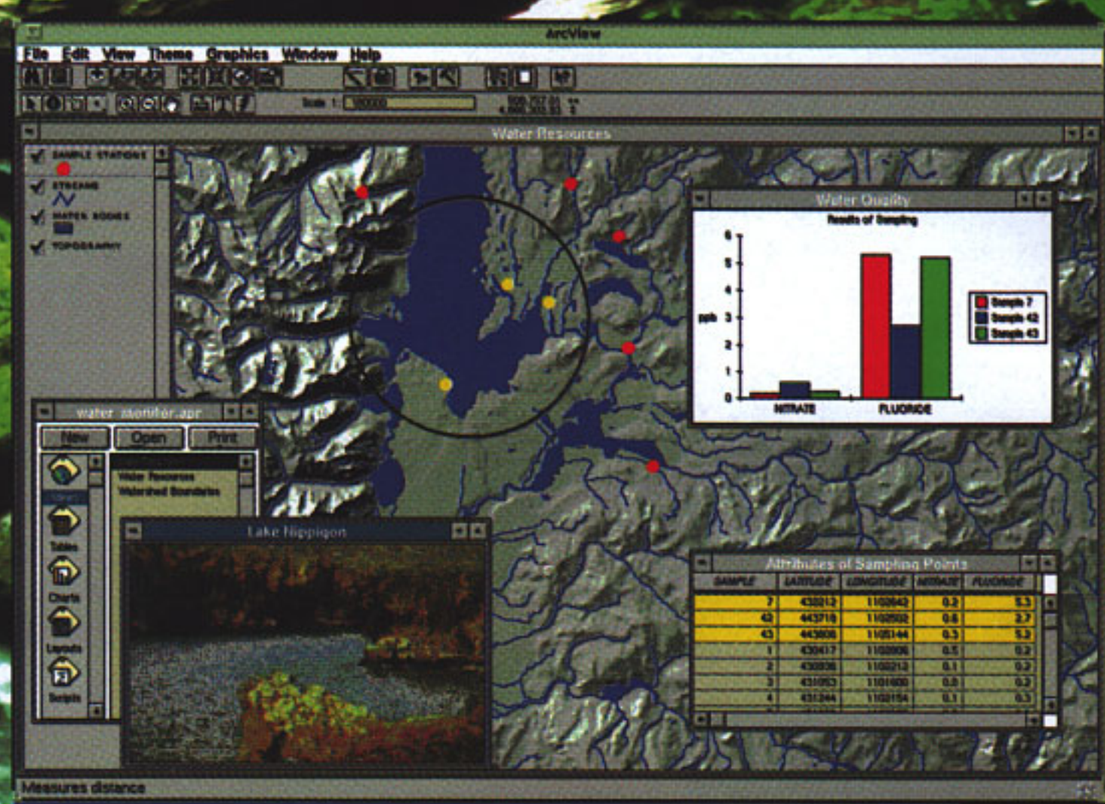

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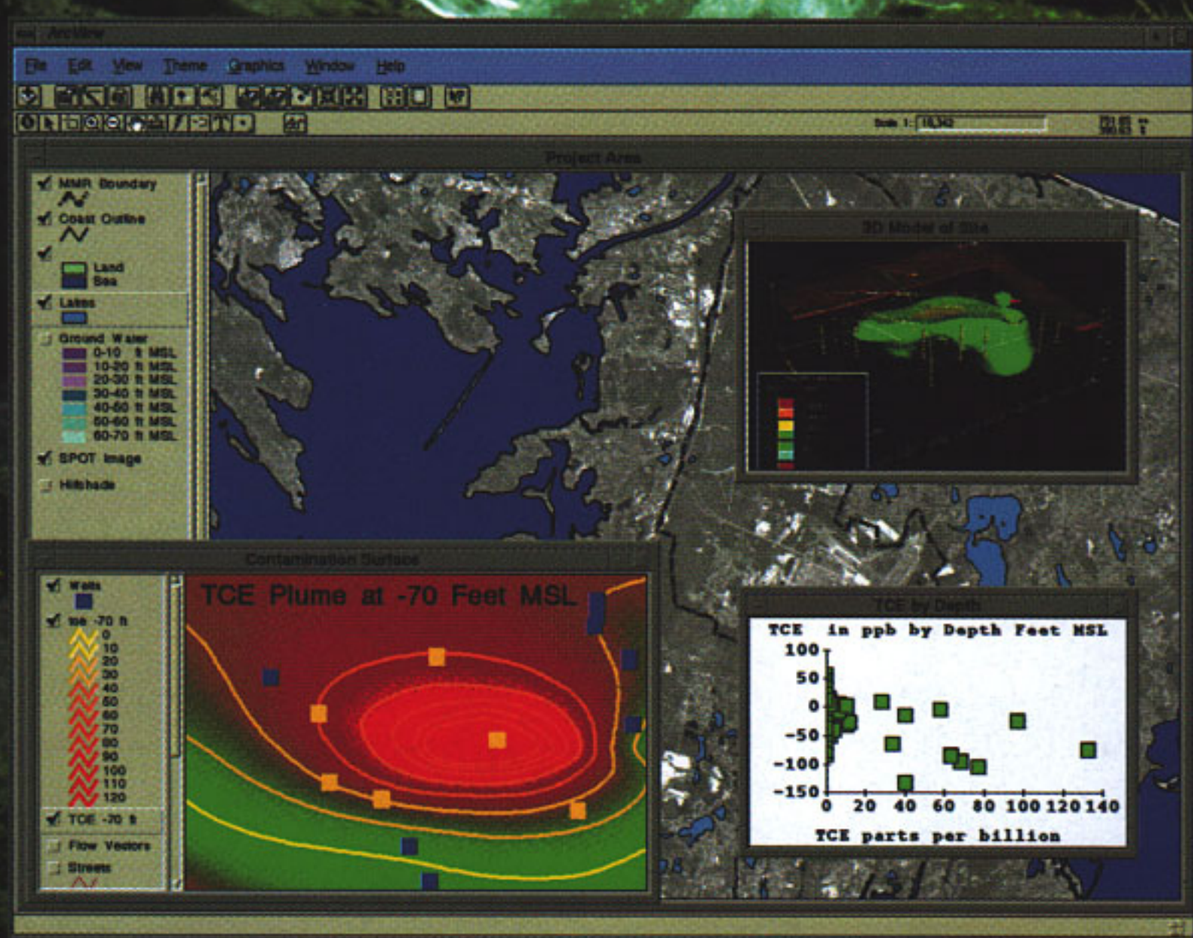

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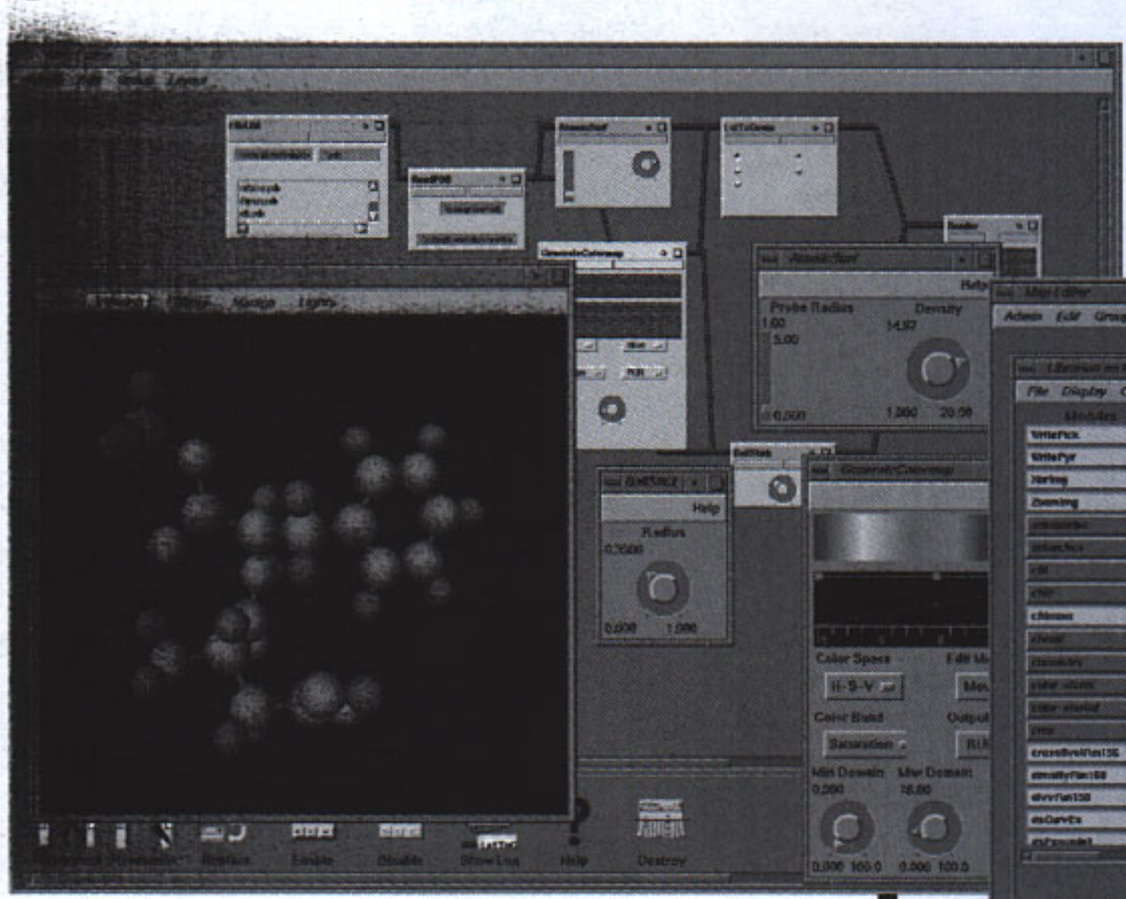
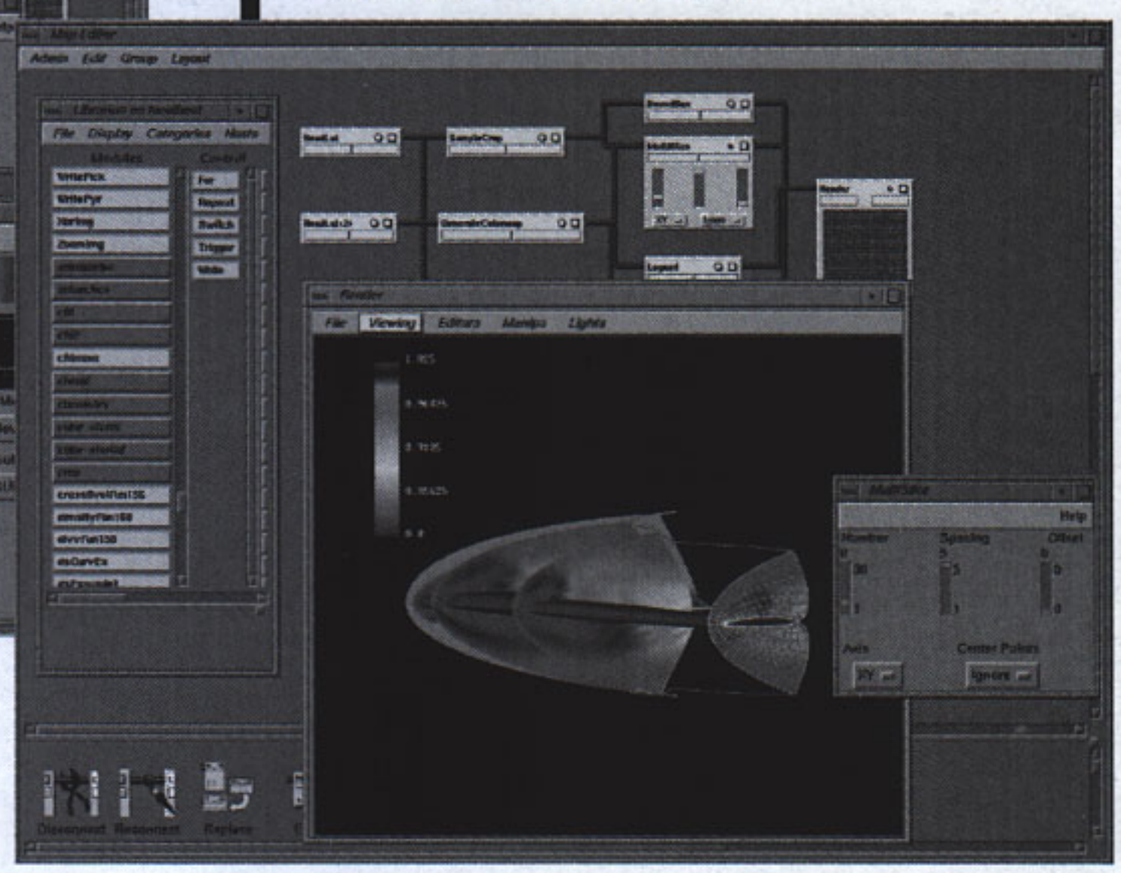


The IRIS Explorer map above uses configuration data for a molecule, stored as a Protein DataBase file (PDF) and creates a ball-and-stick representation.

IRIS Explorer can be used to study the dynamics of air flow. Illustrated below are variations in air density surrounding the surface of an aircraft wing.



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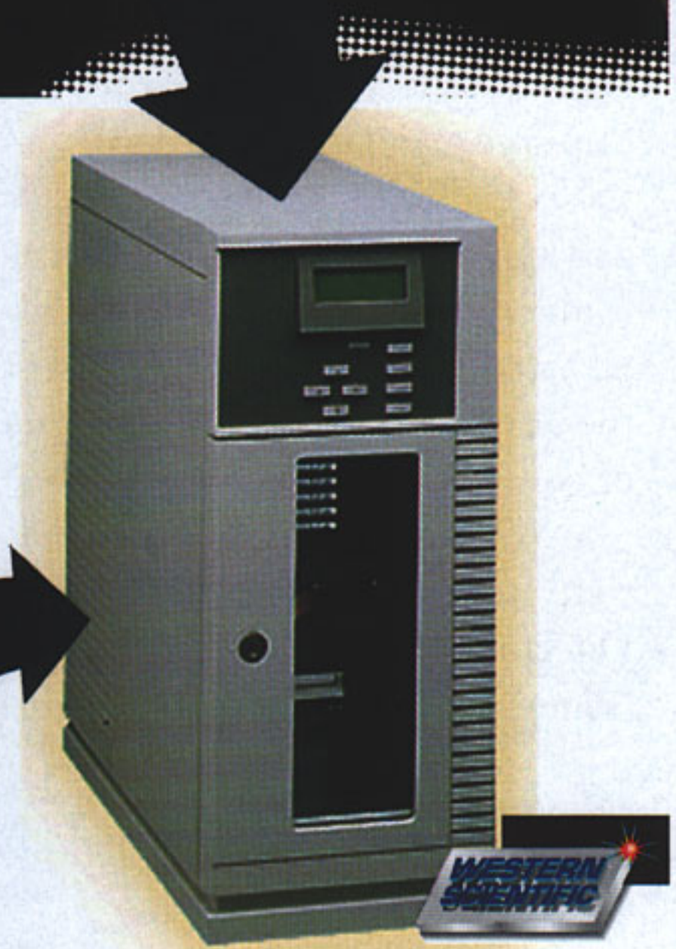

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THE UNIVERSE IN A CAVE

Science collides with art when a stellar group of experts from diverse fields teams up to tell the story of creation in the virtual reality CAVE at the University of Illinois.

By Jonathan Luskin

In 1940, Mickey Mouse starred in the role of a lifetime as the precocious assistant to a powerful magician in the film classic *Fantasia*. Aided by a magical hat, he stood high on a cliff and conducted the heavens to the thunderous beat of "The Sorcerer's Apprentice." With each sweep of his three-fingered hands, the deftly animated rodent smashed comets and galaxies in starry explosions.

Five decades later, a human figure plays cosmic conductor, harnessing the power of Silicon Graphics computers at the University of Illinois at Urbana-Champaign. At a vast high-performance computing facility and research center, National Center for Supercomputing Applications (NCSA), Bob Patterson, art director and visualization and virtual environment design expert, uses a digital baton to conduct a simulation of the universe through a billion years of cosmic evolution.

With the Silicon Graphics hardware and proprietary software Virtual Director™, Patterson is able to view stars "so real you can nearly reach out and touch them." Projected on three walls and on the floor under his feet, the universe merges into bright clouds of condensing gas. Galaxies spin past and collide in a dance calculated by state of the art computer simulation.

This still from the cosmic voyage shows two spiral galaxies colliding with terrific force creating tidal tails of gas and stars. Eventually they will merge to form a single galaxy. The entire shot, which lasts almost two minutes and represents a billion years, amounts to 54 gigabytes of digital imagery. Simulation by UCSC; Visualization by NCSA. Copyright of Smithsonian Institution, Motorola Inc., Cosmic Voyage Inc.

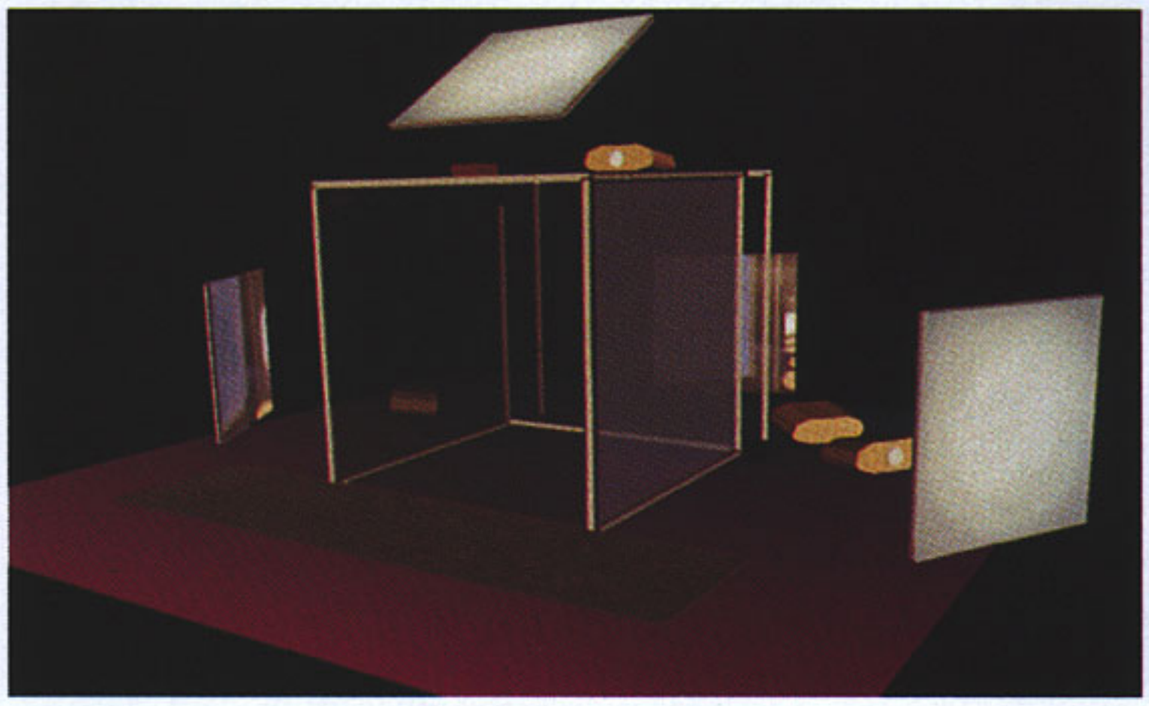
The CAVE

This masterpiece of visual computing takes place inside the Computer-Assisted Virtual Environment (CAVE™), a small, box-shaped theater, measuring 10 by 10 by 9 feet. The acronym "CAVE" aptly refers to Plato's *Allegory of the Cave*. Like its mythical Greek predecessor, the room is a paradigm for the exploration of reality, illusion, and, most importantly, education. Plato called it the "art of producing vision."

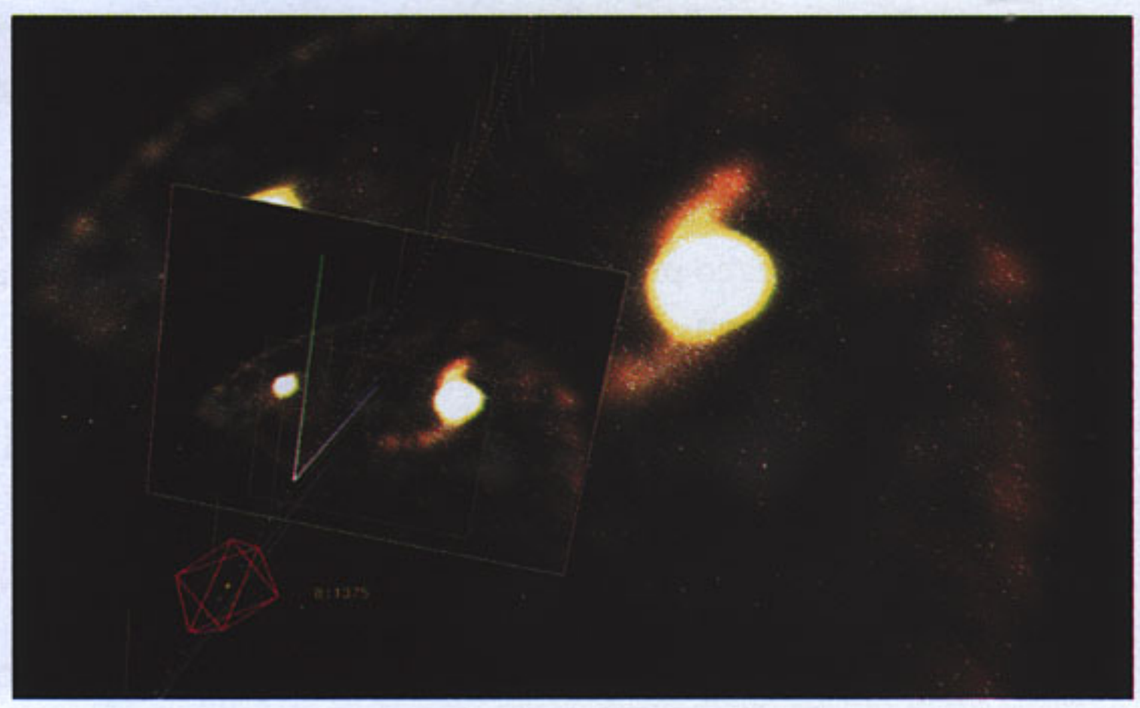
The CAVE is a collaboration between University of Illinois campuses at Chicago and Urbana-Champaign. First publicly displayed at SIGGRAPH '92, the CAVE was developed at the University of Illinois at Chicago by the Electronic Visualization Laboratory (EVL). Founded 20 years ago, EVL is a unique blend of engineering, science, and art expertise.

In 1992, NCSA's Virtual Environments Group (VEG) at the University of Illinois at Urbana-Champaign (UIUC) joined EVL to further develop the CAVE. VEG, created to make interactive, immersive technologies usable for investigating problems in science and engineering, brings wide expertise in supercomputing and networking to the

Standing in the CAVE automated virtual environment, Bob Patterson and Donna Cox use the Virtual Director software to previsualize a galaxy collision choreography for the Cosmic Voyage film. They use a wireless microphone to enter over 50 voice commands and a magnetically-tracked wand to navigate around the simulation and position the camera. Photo by Jeff Carpenter/NCSA.



The room-sized CAVE is a 3D video and audio environment. High-resolution stereo graphics are rear projected onto three walls and the floor. Mirrors are used to gain the appropriate distance for projections. Image courtesy EVL/UIC.



This image, taken inside the CAVE, shows the virtual camera (the heavy blue and green lines that form an L-shape) as it moves along the camera spline (the white dotted line), viewing 3D colliding galaxies. The texture mapped rectangle represents what the camera sees. The red shape highlights the current keyframe.

CAVE. Besides the CAVE on the UIUC campus, additional CAVEs are sited at the ARPA Enterprise in Arlington, Virginia, and the Argonne National Laboratory in Argonne, Illinois.

Immersive Environment

The CAVE serves a broad set of clients in science, engineering, education, and business. CAVE software applications have been developed to research diverse topics, including the study of living organisms through computer simulation (known as "artificial life"), the visualization of the electrostatic field activity of acetylcholinesterase enzymes, four-dimensional hyperspace, climate data, and weather hazards, and the modeling of the human heart, molecular dynamics, and virtual urban landscapes. Industry has also discovered the CAVE for solving manufacturing problems: the Caterpillar corporation used it to design backhoe and wheel loaders.

The CAVE environment offers researchers the advantage of immediate, first-hand experience of visual simulation. According to Professor Donna Cox, UIUC School of Art and Design, "the best thing about the CAVE is you get a feeling of immersion. You can physically move your head and everything moves." Thomas DeFanti, EVL founder and NCSA's visiting associate director for virtual environments, agrees; "Unlike workstation graphics, where you are on the outside looking in, in the CAVE you are on the inside looking out."

CAVE Technology

Animation in the CAVE is computed in real time by two Silicon Graphics Onyx supercomputers, each with eight processors, one gigabyte of RAM, and two graphics pipelines. The graphics pipelines have their own RealityEngine processors and two raster manager boards.

The software interface is controlled through voice recognition and a 3D mouse or "Wand." The wand features three buttons and an electromagnetic sensor that tracks its position and orientation in space. The illusion of reality is aided by powerful video projectors that beam stereographic images onto the walls and floor. Goggles with liquid crystal eye shutters resolve the stereo projected images for realistic 3D viewing. A second magnetic tracking device is attached to the goggles; as you move your head, the stereo convergence is continuously recomputed and optimized for your specific viewing angle. Sound emanates from four speakers placed high in the corners of the room. Real-time interactive sound synthesis is provided by two Silicon Graphics Indy workstations running software developed by NCSA's audio research group.

Virtual Director

Visual simulation, like the most demanding feature animation, requires precise control over the virtual camera. The CAVE, backed by the Silicon Graphics graphics computing power, had few problems visualizing vastly complex databases, but needed a tool to choreograph camera motion for both aesthetically pleasing and scientifically revealing results. The result was "Virtual Director."

The Virtual Director software was developed by Cox and Patterson of VEG in partnership with EVL programmer Marcus Thiebaux. The program provides a user-friendly, virtual-reality method to control camera motion for instant playback or animation recording. Stored camera-motion data can be used to control various computer rendering tools such as Wavefront, or custom software such as "Star Renderer" written by Loren Carpenter of PIXAR.

The Silicon Graphics POWER CHALLENGE-array system at the National Center for Supercomputing Applications is one of the largest installations in academia. NCSA also has a large network of Silicon Graphics workstations including Indy, Indigo² and Onyx that are used by students and research scientists.

Cosmic Voyage

One of the CAVE's most exciting projects to date is *The Cosmic Voyage*, a 40-minute IMAX film created for The Smithsonian Institution's 150th anniversary this year. The film, directed by Bayley Silleck and produced by Jeffrey Marvin, will transport viewers across millions of years of universe formation inside the Smithsonian's National Air and Space Museum in Washington, D.C.

The film's three scientific visualization elements, about four minutes of computer simulation, are the result of a stellar collaboration of luminaries from universities, national science laboratories, and animation studios. UIUC's Donna Cox, who assembled and orchestrated the far-flung group, acted as the associate producer and art director for this segment of the film.

The sequence begins with the Big Bang, created by NCSA and PIXAR Animation Studios. Next is a condensing galaxy simulation, developed at Princeton University and computed on a Silicon Graphics POWER CHALLENGE server, part of NCSA's POWER CHALLENGEarray, a potent High-Performance Parallel Interface (HiPPI) network of eight Silicon Graphics machines boasting 84 CPUs. The final simulation of colliding galaxies was created at the University of California at Santa Cruz (UCSC) and computed at the San Diego Supercomputing Center.

The three-dimensional simulation data was loaded into the CAVE where camera moves for the film were choreographed through time using Virtual Director. Images were rendered using PIXAR's Star Renderer software running on the Silicon Graphics POWER CHALLENGEarray system. Finally, the rendered images were shipped off to Santa Barbara Studios in California to be scanned out to film on a Solitaire film recorder. Each frame of the computer animations was computed at 4096 by 3002 pixel resolution to accommodate the IMAX motion picture frame, the largest format in the world (about three times the area of normal 70 millimeter film, or about 10 times the area of standard 35 millimeter film).

"This is the first large format film that had so much high-resolution computer graphics in it, where the choreography was done in virtual reality, and so much computational science was used for special effects," says Cox. "It looked so organic that when people first saw the galaxies condensing they thought they (the galaxies) were living paramecium."

Real Science

Two astrophysicists, Michael Norman of NCSA and Frank Summers of Princeton University, were responsible for ensuring that the basic science of *Cosmic Voyage* accurately illustrated the early universe and its expansion. Summers tested simulations from his graduate thesis on his Silicon Graphics POWER CHALLENGE server, a 14 processor workstation with 4 gigabytes of RAM. He then scaled the simulation up by a factor of 10, to meet the resolution of the IMAX screen, and

computed the results on the NCSA POWERCHALLENGEarray. The resulting 60 gigabytes of data were retained on line for production and archived using NCSA's mass storage system.

"Using real data for scientific visualization was probably the only way to educate about the early universe," Summers said. "In order to show the very complex, nonlinear, very dynamic aspects, you really had to draw it on the computer."

Summers, a former ice dancer who once ranked tenth in the nation, lauds the CAVE interface. "Having visual feedback to body motions felt very intuitive to me," Summers said. "With the CAVE we were able to choreograph multiple camera moves quickly and watch them dynamically."

Massive Files and the Internet

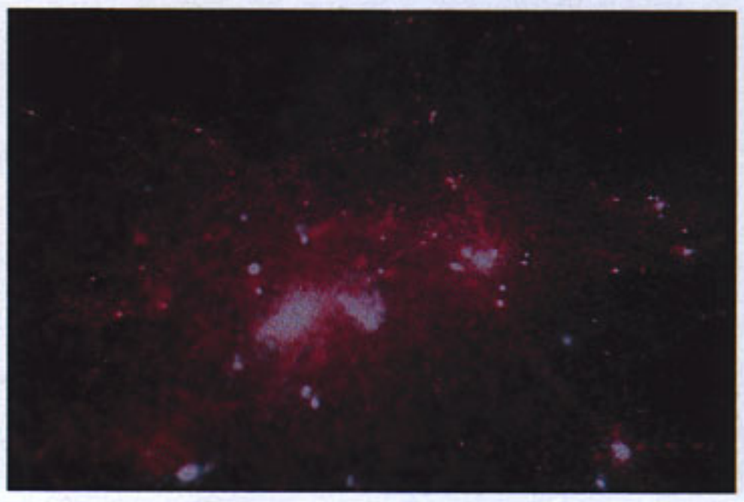
Managing the enormous files for *Cosmic Voyage* was a challenge. "The network and the mass storage were as important as the rendering," Cox said. "We exchanged single frame tests and image wedges constantly with PIXAR. Loren Carpenter would send updates of the Star Renderer to Erik Wesselak at NCSA, who wrote a high-level interface to control the many rendering parameters."

The Internet played a central role in productive communication among Summers at Princeton, Greg Bryan at NCSA, and Loren Carpenter, Don Schreiter, and Mark Vanderwettering at PIXAR, all of whom collaborated on the Big Bang simulation. "I never met Mark," Summers said. "Through e-mail Greg and I described the mathematics and physics of the Big Bang sequence. We then sent images back and forth across the Internet."

The Internet was also used to move data across the country. Summers computed one background star field element at Princeton, then shipped the result across the NSFnet, a high-speed, T3-based link between Princeton and NCSA. Chris Mihos and Lars Hernquist, both of UCSC, calculated the galaxy collision simulation at the San Diego Supercomputing Center, then sent the many gigabytes of data to Barry Sanders of NCSA. Sanders managed the transfer using MCI's experimental, ultra-fast, vBNS test-bed network. Hundreds of megabytes of test frames also crossed the Internet from PIXAR and NCSA to Santa Barbara Studios for scanning to film.

CAVE of the Future

One tantalizing aspect of CAVE projects such as the *Cosmic Voyage* is the prospect of advancing science and art simultaneously. "I'm very optimistic that some good science will come out of it [the film]," Princeton's Summers said. He plans to screen the film at the annual American Astronomical Society Convention this year.



Cosmic Voyage takes the viewer through this supercluster of forming galaxies, then jumps ahead millions of years to see the galaxies collide. Simulation by UCSC; Visualization by NCSA. Copyright of Smithsonian Institution, Motorola Inc., Cosmic Voyage Inc.

Patterson, who returned to NCSA after suffering computer-related injuries working in film special effects, sees an enormous future for the CAVE as an alternative interface that would allow workers to avoid injury, or even work and heal at the same time. Patterson also envisions exciting future film applications for the CAVE. "Motion capture and the Virtual Director would be a wonderful team," he said. "A director could stand inside the CAVE, direct motion capture artists outside of the CAVE, and see their digital representations composited into a virtual set. They could do ten takes in the morning instead of suffering through ten thousand clicks and drags."

Previsualization of camera positions for live-action shooting is another natural application for the evolving CAVE technology. Patterson relishes the prospect: "As a live-action director I think it would be great to use a digital model of the real set to previsualize where you are going to put the camera crane, how to cover the scene, and where to put the dolly tracks."

The compelling immersive environment of the CAVE, the computational might of the POWER CHALLENGEarray, and the ultra high speed of cutting-edge networks, are a radical combination of hardware, software, and transcontinental creative talent that may someday become as commonplace as a home appliance. Plato used his cave in an allegory arguing for the wisdom of kings and the education of the common man. We too have a CAVE—for research, education, and entertainment; by entering there, we can discover the universe.

The *cosmic voyage* premieres at the Smithsonian this Summer, then travels to some of the more than 125 IMAX theaters around the world. For a fascinating glimpse of the CAVE experience, visit the "Immersadesk", a one-wall "CAVE", at SIGGRAPH '96 in New Orleans this summer. ★

Jonathan Luskin has worked as a technical director/animator for R/Greenberg Associates and a computer graphics supervisor at Industrial Light & Magic. He is currently teaching animation at San Francisco State University and making independent films. Email: JLuskin@aol.com

See more about the CAVE on the World Wide Web:

NSCA's Virtual Environments Toolset
http://www.ncsa.uiuc.edu/Pubs/access/94.2/VEToolset.html

NCSA's Silicon Graphics POWER CHALLENGEarray Technical Summary
http://www.ncsa.uiuc.edu/General/Consulting/TechSummary/odin.html

Virtual Director Software
http://www.ncsa.uiuc.edu/EVL/docs/VROOM/HTML/PROJECTS/48Thiebaux.html

Cosmological Structure Formation in the IMAX Film Cosmic Voyage
http://zeus.ncsa.uiuc.edu:8080/Summers/IMAX.html

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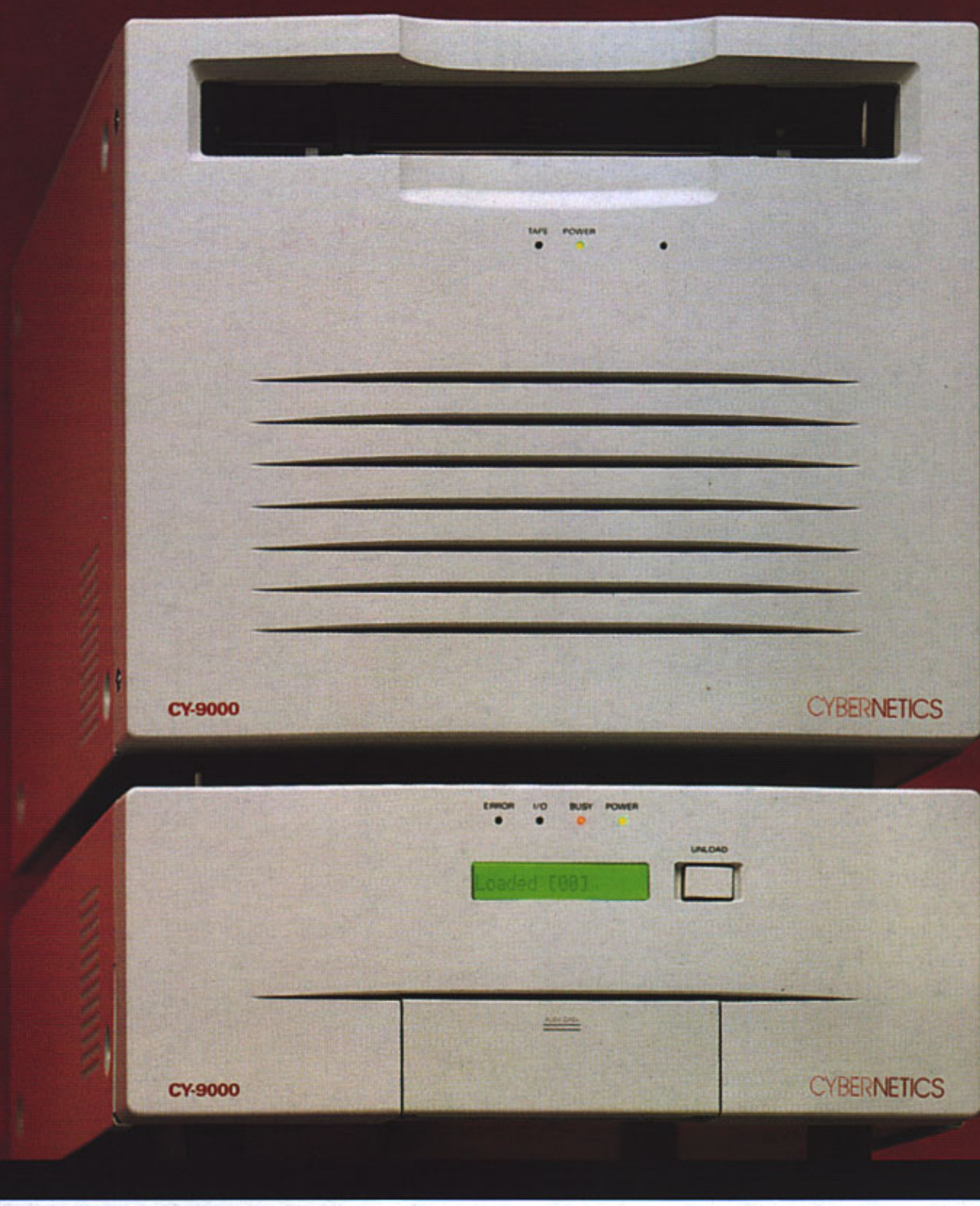

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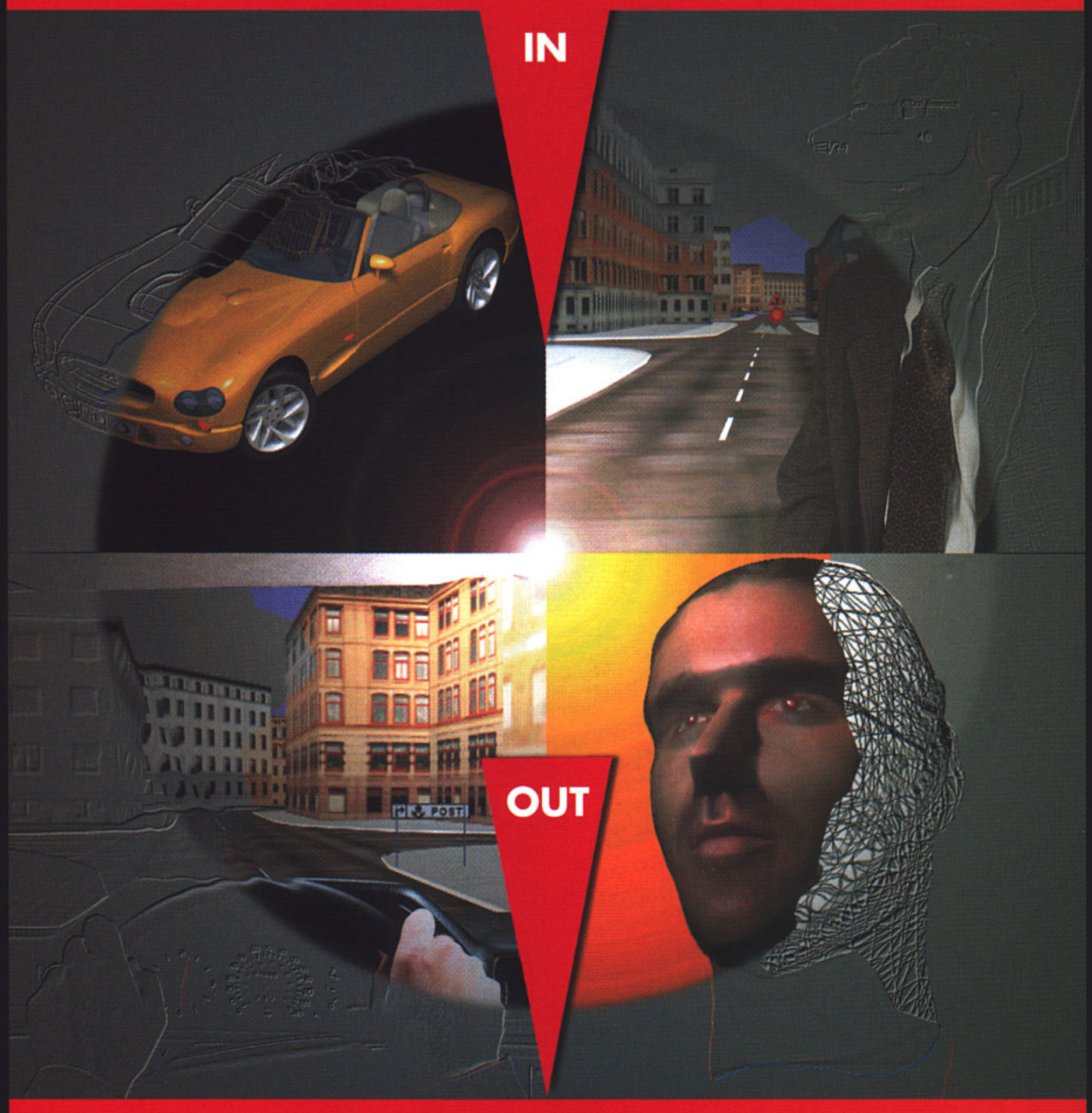

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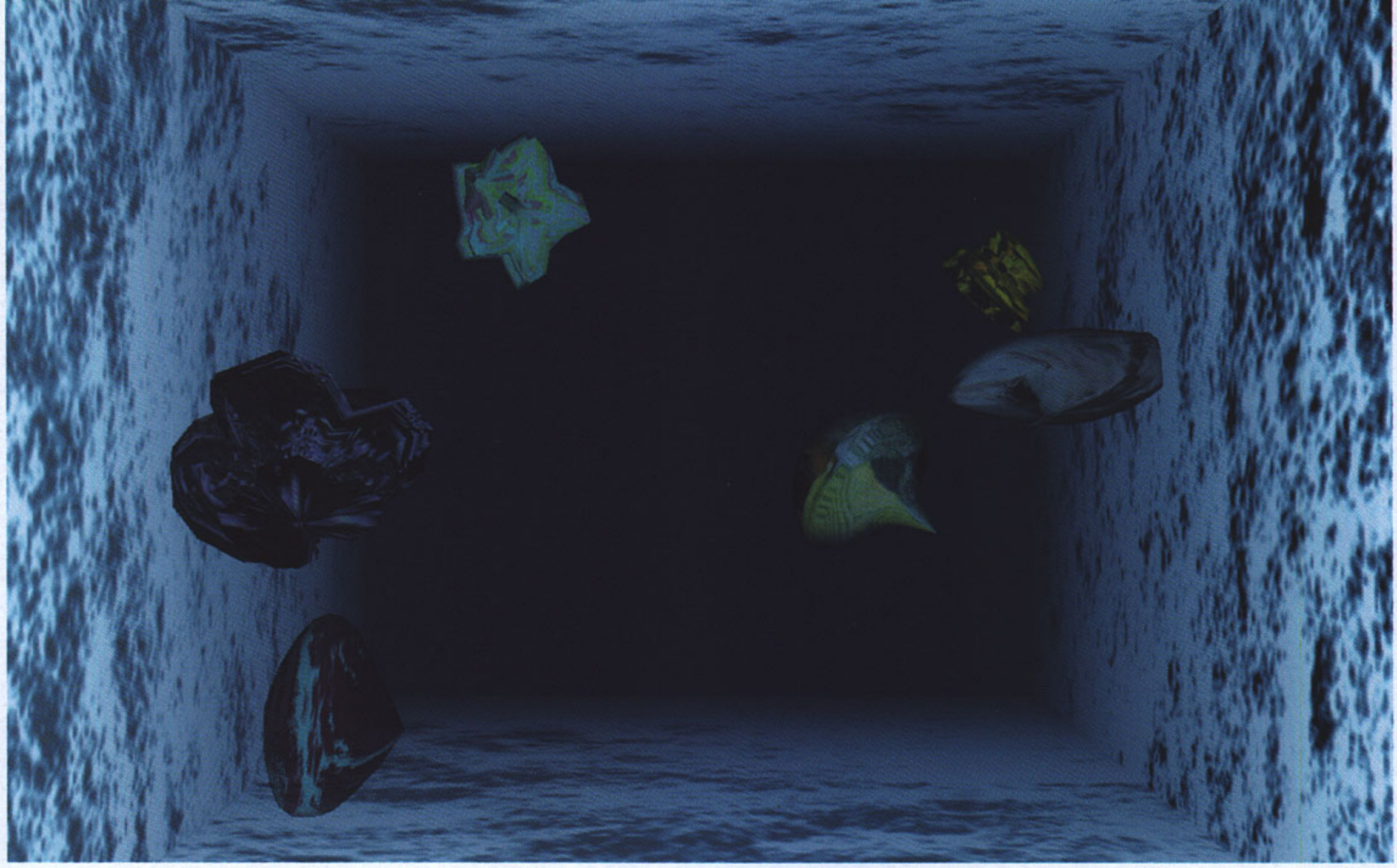

The Brave New Worlds of Sommerer & Mignonneau

Art mimics and creates life when people interact with virtual creatures and digital plants in the art installations by two European visionaries.

By Lorne Falk

You're standing in a dark room transfixed by an incredibly lush tapestry of digital plant life filling the wall in front of you with persistent, caterpillar-like movements. You can hear it growing. Or is that something eating? You notice a flashlight resting innocently on a pedestal beside you. When you shine its beam on the tapestry, butterflies emerge from cocoons buried in the digital growth. They dance after the light as you explore. As the beam roves, releasing more butterflies, it erases the tapestry. When you finally pause, the small cloud of butterflies fly directly into the light, and die. Their bodies float down the almost blank wall into the darkness of the floor. You're left with a tabula rasa, and a tumble of thoughts about life cycles and your complicity in them. You turn off the flashlight and turn to leave. You hear that growing noise again. A new tapestry has begun to etch its way back into existence. You pick up the flashlight. The cycle begins anew.

Welcome to one of many worlds created by Christa Sommerer and Laurent Mignonneau, a dynamic cyberteam who use the power of Silicon Graphics workstations to create interactive environments. Their work explores a new kind of symbiosis—in the broadest terms, how real and artificial organisms can live together and contribute to each other. The real organisms are invariably people, although plants have participated, too. The artifi-

***At right and above:** In* A-Volve, *virtual creatures are projected onto a screen in a pool of water. The creatures, powered by a Silicon Graphics Onyx RealityEngine, evolve over time—competing, mating, killing, reproducing, and dying.*

cial organisms bear an uncanny resemblance to a wide range of flora and fauna.

To probe the interface between real and artificial life, Sommerer and Mignonneau have cultivated a playful proficiency with interactivity, computer graphics, virtual reality, communications, artificial life, and links between art and science. The results of their efforts have been groundbreaking: real-time access to virtual space, unencumbered interaction, wireless interfaces, natural interfaces (such as plants and water), multiple viewer interaction, natural algorithms (for modeling, movement), and individual feedback for the user.

Sommerer and Mignonneau began their collaboration in 1992 when they met at the Institute for New Media (INM) in Frankfurt, Germany. Sommerer, who is Austrian, went to the INM in 1990 on a research grant following studies in biology and sculpture in Vienna. The French-born Mignonneau, after completing an arts degree in computer graphics and video, worked on computer animation, C programming, and analog and digital electronic interface design and conception before he turned up at the INM on a Eurocreation grant.

Interactive Plant Growing

For their first installation in 1992, *Interactive Plant Growing*, Sommerer and Mignonneau programmed artificial plants to grow in a virtual 3D space. By touching real plants wired to a 4D-VGX 320 Silicon Graphics workstation, viewers influence and control the growth of virtual plants that appear in real time on a large screen.

"A plant is a like an antenna—it responds to the viewer's voltage," Sommerer explains. "People randomize the growth. Without people the growth would not exist." The virtual growth is based on algorithms developed according to different morphological characteristics of real plant differentiation.

Interactive Plant Growing explores the form of plants as an event in space-time, and not merely a configuration in space. Called "epoch making" in the development of virtual reality and interactivity, the installation has subsequently been shown in 14 countries.

A-Volve

In 1993, Sommerer & Mignonneau were invited to work at the National Center for Supercomputing Application (NCSA) at the Beckman Institute in Champaign/Urbana, Illinois. Here they began work on their next project, *A-Volve*, a real-time interactive environment for artificial life organisms which they completed in 1994 during a three-month residency sponsored by ICC-NTT at the Advanced Telecommunication Research Institute (HIP Lab) in Kyoto.

In *A-Volve*, viewers create artificial life forms by drawing on a small digital touch screen. Animated versions of these user-conceived "genetic maps" are born

At left and above: In* Transplant, *visitors create a virtual jungle with body movements. No wiring is used. The interaction, unemcumbered and in real time, is powered by two Silicon Graphics Indigo² Extreme workstations.

Above: In Intro Act, *visitors interact with their own images reflected in a virtual "mirror" in real time. Body movement creates a unique organic world for each person, based upon body gesture, size, speed and general action. The installation is powered by two Silicon Graphics Indigo² Maximum IMPACT workstations and a Indy 200MHz.*

moments later onto a second 3 x 5 foot screen which forms the floor of a pool of water. Viewers crowd around the pool to urge the survival of their digital creatures. Artist-developed algorithms insure the smooth, natural movements and "animal-like" behavior of creatures as they wiggle and swim.

None of the creatures are precalculated; they are all born, live, procreate, feed, and expire exclusively in real-time in the pool, through the interaction of the visitors and the interaction among the creatures themselves. An unlimited variety of possible forms (with effort, speed, direction, and shape) represent human and evolutionary rules.

"I was interested in using genetics," says Mignonneau, "genetics of my own design. But finally, I wanted to let the work evolve by itself."

A-Volve celebrates the user-computer interface as a playground of life in which users quickly become instructive guides for other users, and where users, suddenly invested in a shared future, gathered around the pool to watch their artificial offspring live their lives.

Trans Plant

In 1995, Sommerer & Mignonneau were asked to produce a permanent installation for the Tokyo Metropolitan Museum of Photography in Tokyo's new Ebisu Garden Place. They responded with *Trans Plant*, an interactive environment that allows visitors to enter a virtual space, where they can see themselves creating a virtual garden with each body movement. Body gestures, frequency of movement, and body size directly affect the growth of the virtual plants.

"I not only create a forest or a jungle," says Sommerer, "I also become an intrinsic part of that landscape." Since free and immediate access to virtual space and the creation of environments that reflect the viewer's individuality are key design issues in their work, Mignonneau developed a new "3D Key" hardware system—similar to a virtual set—that allows the visitors to physically cross three-dimensional virtual space in all three dimensions for the first time.

At right: Another scene from Intro Act.

Intro Act

Sommerer and Mignonneau's most recent work, *Intro Act*, opened in December as part of the Biennale d'Art Contemporain in Lyon, France. Using the "3D Key" system developed in *Trans Plant*, *Intro Act* allows the visitor to enter the virtual space totally unencumbered by devices and to interact freely in real time.

In *Intro Act*, the visitor interacts with an image of her virtual self projected in front of her, as in a mirror. The virtual mirror reflects not only the visitor's image but also her actions and exploration. As a visitor moves her body freely, her gestures trigger organic shapes to form in the virtual mirror. These abstract, nonlinear, multilayered forms relate to the visitor's body, position, size, speed of movement and actions in general.

Reality is transformed in real time by Silicon Graphics workstations that generate the virtual vision of the visitor as she interacts with a circle of digital feedback of her own actions and reactions. As the interpretation code is not preprogrammed but flexible, *Intro Act* can adjust to new situations, allowing each visitor to experience her own unique virtual world.

Above: In Phototropy, *the visitor uses a flashlight to control the behavior of virtual insects—enabling them to fly, reproduce, and ultimately, die—powered by a Silicon Graphics Indigo² Extreme workstation.*

Creative Collaboration

It's clear to these two innovators that the role of art has changed with the technology. "Art has becomes an interactive participatory process," Sommerer reflects, "where the audience, the artist, and the artwork itself can work symbiotically to create an evolutionary artistic process. Interaction and real-time access to virtual space become essential when talking about these issues. Silicon Graphics computers enable us to work with high-speed, high-resolution, real-time, 3D graphics and allow us to program our own software code."

To achieve the fluid metamorphic quality that characterizes so much of their art, Sommerer and Mignonneau are methodical and rigorous in their creative collaboration. "Once we have the concept and idea for a new installation, we have to deal with the question of the interface. After developing the hardware interface, we work on the graphics and the protocol. Since real-time feedback is essential, we develop interfaces and graphics that allow immediate interaction with the visitors. Once the basic graphic code is written (C and C++), we design it and work on all the details. When the protocol is done, we test the system and adapt it to the "real" situation. The most exciting moment, of course, is the opening of the show: when people use the system the first time and we can observe their actions and reactions, and get their feedback."

Sommerer & Mignonneau are currently guest researchers at the Advanced Telecommunication Research Institute in Kyoto in the newly established Media Integration and Communication (MIC) Laboratories. Their research involves the creation of a virtual communication environment called "MIC Exploration Space" which allows remotely located participants to interact with each other through their environment by using gestures, interaction, speech and sound.

The cyberteam's future projects include *Life Spacies* for the ICC NTT Museum in Tokyo in 1997 and *Para-Site* for the new Ars Electronic Center which will open in Linz, Austria, this summer. Their busy schedule is our boon: Sommerer and Mignonneau bring to life a near-future, where virtual space and human access to it are artistically and culturally, as well as technically, essential. ★

At right: Another scene from Intro Act.

See more about Sommerer & Mignonneau on these Web sites:

Sommerer & Mignonneau home page: http://www.mic.atr.co.jp/~christa

ATR: http://www.atr.co.jp/

ICC-NTT: http://www.ntticc.or.jp/

Institute fuer Neue Medien: http://www.inm.de/

Biennale of Lyon: http://www.culture.fr/culture/biac95/ biennale

Ars Electronica: http://www.ncsa.uiuc.edu/Pubs/access/94.2/Electronica.html

Lorne Falk has written and published more than 60 critical essays and produced 19 publications about creativity, media, and issues that cause change and affect trends in today's world. Lorne lives in Los Angeles where he consults as a strategist, resource provider, and human condition specialist. E-mail: Forlorne@aol.com.

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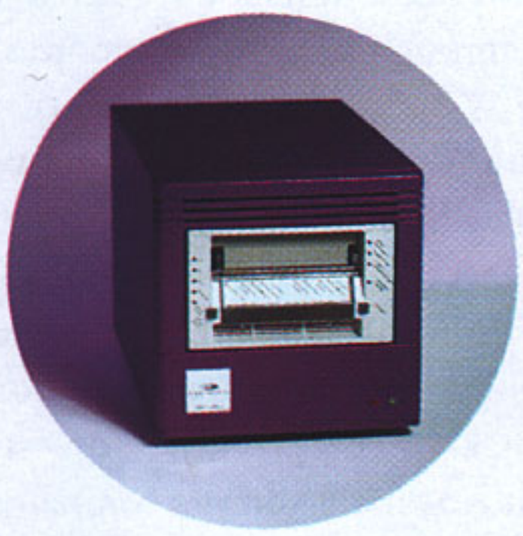

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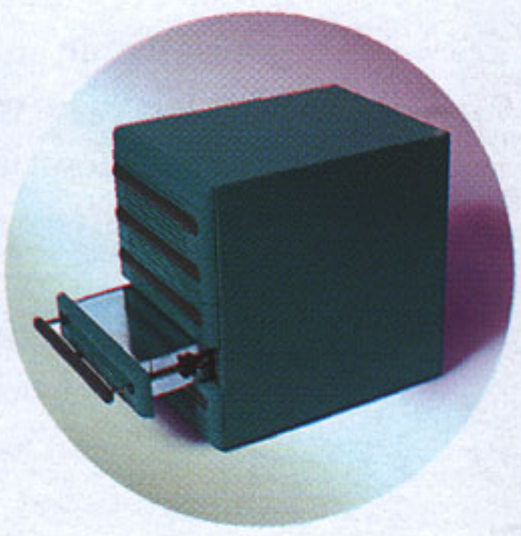

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Behind the corporate firewall, the World Wide Web is rapidly changing internal operations and transforming the way people work together.

By Douglas Cruickshank

The Internet and its extraordinarily popular graphical component, the World Wide Web, have been getting the lion's share of media attention over the last couple years, but Intranets may prove to have an equal impact on the way organizations around the world do business. The new word "Intranet" was coined to describe World Wide Web technology used solely for internal communications.

Intranets employ the same information organizing principles as the World Wide Web, a graphically-oriented, highly flexible approach that can be tailored to the existing structure of virtually any organization or project. Yet unlike the Internet, an Intranet can only be accessed by individuals within an organization, and by outsiders who've been given passwords to allow them in. A special network security device known as a firewall keeps out all others.

Silicon Junction, Silicon Graphics' Intranet page.

Organizations use their Intranets, or company-wide Web sites, to distribute information and computing applications for everyday communications such as on-line employee newsletters, and even as virtual meeting places for work groups. And employees who travel—such as sales personnel—can use the corporate Intranet to keep in touch with headquarters and stay abreast of late-breaking product or price information.

Silicon Sales, Silicon Graphics' internal sales guide.

Ed McCracken, Silicon Graphics chairman and CEO, believes that his company's Intranet serves as an excellent model for behind-the-firewall use of the Web in organizations. "I think we're further ahead in terms of being a showcase for using the Web inside a company than perhaps any other company in the world," McCracken said recently. "We find that when people hear about what were doing, information systems executives, CIOs from around the world come to visit us just to look over our shoulders and see what's happening at Silicon Graphics."

"Our company is in the process of being transformed in terms of how we operate, how we work with each other, and by how we use the Web," McCracken said. "In the beginning it was simply a way to find out what was going on around the company. Now, we're moving into training: employee training information can be accessed on line in a variety of media forms. We provide access to databases. For example, employee benefits forms are available on line. And our corporate purchasing system is going on line. This enables employees to fill out a purchase request and pass it through the approval loop, all on the Web. There is a whole set of applications that are changing how we operate within the company."

Most companies with Intranets have a central internal Web server that functions as the entry point—a sort of digital Grand Central Station—to all that is available on the company-wide Web. At Silicon Graphics it's called *Silicon Junction*. *Silicon Junction*, as described in a brochure the company circulates to employees: "is like an on-line newspaper combined with a table of contents for Silicon Graphics Web pages. It has daily news and stock information and it has indexes for hundreds of Web pages on other internal Web servers. *Silicon Junction* is also a repository of reference material, including on-line manuals, press releases, and the Cafe Iris (employee cafeteria) lunch menu."

Silicon Graphics encourages all its employees to create their own Intranet Web pages for work-related purposes or just for fun. WebMagic, the company's own Web authoring software, is made available on the Silicon

Graphics Intranet at no charge, as is training and assistance. The company also provides classes in Web authoring for its employees. In the relatively short period of time since the advent of the Silicon Graphics Intranet, individuals and groups within the company have embraced the technology with enthusiasm. Groups in each division have taken it upon themselves to develop distinctive Web pages representing their area, making the Intranet the backbone of company-wide communications. And it's a good thing—the company, with 7,000-plus employees, has more than 30 buildings at its Mountain View, Calif. headquarters and more than 100 offices around the world. Keeping all employees apprised of the internal workings of one of the fastest-growing companies in the world's fastest-moving industry is essential. As of early 1996, Silicon Graphics had about 600 internal Web sites carrying a total of more than 10,000 pages of information.

Frank Dietrich

Enriching Business Partnerships

Providing business partners limited access to corporate Intranets can also benefit companies. Frank Dietrich, manager of Corporate Web Systems at Silicon Graphics, who oversees *Silicon Junction* (and is a prime mover behind the company's Intranet development) recently described how qualified resellers of Silicon Graphics systems use the company's Intranet. "The reseller channel is of growing importance to us, and we have a special section on our Intranet devoted to it," Dietrich explained. "That section's called Channel City. It offers sales tools and sales information, as well as sales automation facilities. Using the Silicon Graphics Intranet, resellers can access a database, get all the production information and all the prices they require, and configure a system. There's even a little artificial intelligence built in that assists them in matching components to the desired applications; it helps them provide the right systems for their customers.

Julie Farris

"Once they're finished," Dietrich continued, "it computes all the prices accordingly, and then quotes can actually be sent automatically to prospective customers—by sort of turning the Web server into a fax server.

It's an enormous convenience to resellers, and also helps ensure that customers will get systems appropriate to their needs, and at the correct prices. What's more, resellers can use this feature most anywhere in the world."

Silicon Graphics also uses its Intranet to closely integrate component suppliers with the company's manufacturing operations. Suppliers have access to up-to-the-minute scheduling, technical specifications, and change orders that relate to the components they're supplying. But an Intranet is not only an excellent vehicle for publishing and disseminating information—globally and in real time—Dietrich emphasized. "It is also an extremely effective device for changing the way people use and interact with databases, and link databases together. If you want to use a fancy term, call it 'knowledge engineering.'"

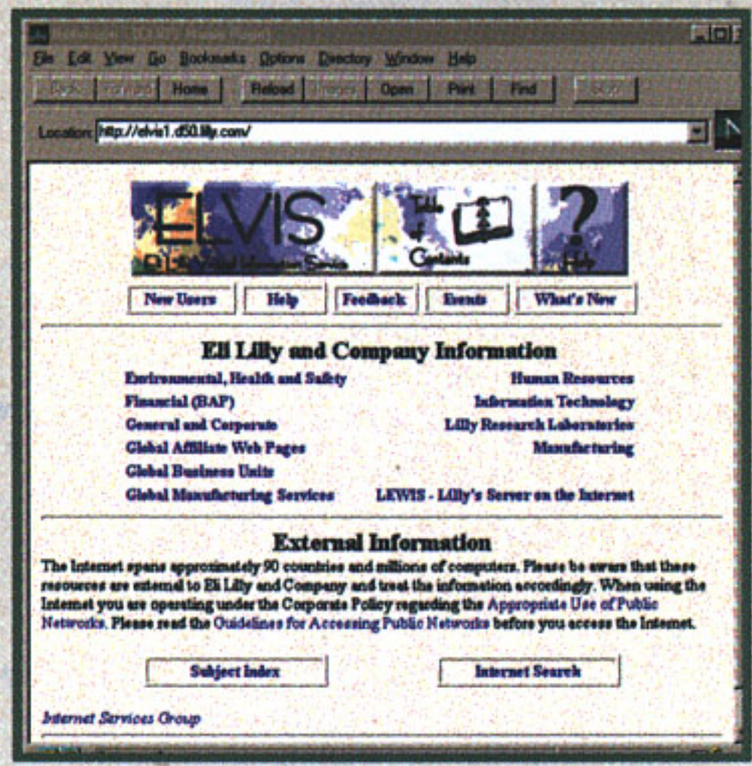
Knowledge Engineering: Linking Isolated Islands

An Intranet makes it possible to integrate data that already exist in databases throughout an enterprise as what Dietrich calls isolated islands and link or cross-reference the data in a way that substantially enhances their value and usefulness. Many companies, including Silicon Graphics, consider this one of the key productivity gains that an Intranet provides. For example, in the past the Silicon Graphics manufacturing database was "separate and independent of the customer call-tracking database. Now, utilizing the Web as a single-user interface, we can link between the manufacturing database and the component that might be at fault according to specific customer reports as logged in the call-tracking database," Dietrich explained.

This means that manufacturing, a function that is typically several levels removed from customer feedback, now has direct access to the database. And customer service personnel can directly reference to the manufacturing database while they're engaged in a customer call. "All of a sudden," Dietrich said, "through this enhanced availability of information, we're realizing extraordinary productivity gains and savings. The Intranet makes it

possible by expanding the collective corporate knowledge —data that has been residing in isolated islands—and making it accessible to all the individuals within the organization in an orderly, highly transparent fashion. And that's just one example," he said. "There are many."

Julie Farris, marketing manager for Silicon Graphics WebFORCE Intranet products, agrees with Dietrich, citing the Intranet's "dramatic returns as a rapid prototyping environment, adept at getting information on line quickly and sharing it across the company, regardless of platforms. All of the information and the content that people already have," Farris said, "whether it is on their desktops, in filesystems, in databases, or tied to other applications, can now be easily shared using the Web. When people first see this it looks like magic to them, because all of a sudden all this information is visible. Of course it's been there all along, it's just that the Intranet provides a ubiquitous way of organizing and sharing it, along with a friendly interface."



ELVIS, Eli Lilly's interactive home page.

One of the most significant changes that the proliferation of Intranets has inspired may be a shift in power from the companies that sell technology to the organizations that buy it. In the past, standardizing computer technology throughout the organization has been a critical concern, often calling for near-impossible product buying decisions. Now, in an Intranet-based computing environment, where platforms ranging from workstations to PCs and laptops all share the same easy-to-use Web browser software (Netscape Navigator is by far the most popular at present), customers enjoy much greater flexibility.

Julie Farris recalls that companies previously "were always faced with the proprietary approach: 'Do we standardize on this computer system, this chip, this software?' And what they'd done at that point [by committing to one enterprise-wide system] is given up some measure of control of their destiny," Farris said. "Now they can go back to choosing the best-of-class platforms for each part of their business and not worry about the interoperability problems. Today the incredible rate of innovation and competition in the high-technology industry really works to the customer's advantage. Prices are lower, the products are better, and customers have the freedom to select components from different vendors, while not worrying about the traditional problems of systems integration."

A Business Trend More Than a Technology Trend

Of course, Silicon Graphics is a technology company and one would expect it to be in the forefront of the Intranet trend, but what about companies from other industries? Certainly one of the best examples—and an organization very different in many respects from Silicon Graphics—is Eli Lilly and Company, the pharmaceutical firm founded in 1876. The company has nearly 26,000 employees and markets its products in 120 countries. John Swartzendruber is an information consultant at Lilly, and technical manager of the firm's Internet Services Group. At present he oversees a burgeoning corporate Intranet that features 15 to 20 internal Web servers.

"We are slowly evolving toward a model with Web servers at various locations, which may be run by central groups who will provide the underlying Web service for the rest of the people in the company," Swartzendruber said. It's a different approach, but no less effective than the one being taken at Silicon Graphics, where there are hundreds of servers. "Rather than each group at Lilly having its own Web server," Swartzendruber said, "there will be a few central servers on which individual groups will maintain directories.

"Right now our Intranet provides everything from basic corporate services, such as a phone directory, mail directory, and calendar of events, to information on various groups within the company, manufacturing, financial information, human resources materials, and coverage of corporate affairs," Swartzendruber continued. "Our scientific groups use it to distribute information on software products or ongoing research. And our sales and marketing people are using it as a means of electronic distribution for publishing sales results, announcing product launches, and so on. People are using it for almost anything you can imagine."

ELVIS Lives at Eli Lilly and Company

Like Silicon Graphics, Lilly also has a main corporate Web server, the digital headquarters for its Intranet. "It stands for the Lilly Virtual Information Service, but it's known as *ELVIS* here at the company," Swartzendruber said with a chuckle.

It works much like Silicon Junction. "People connect to *ELVIS* and they are presented with our internal

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home page, which guides them to content related to other divisions and other business units within Lilly."

At this early stage, placing a dollar value on the benefits that the Intranet brings to a company such as Lilly is difficult, though Swartzendruber offers a compelling illustration: "One of our global affiliates is using our Intranet to distribute information to its associates worldwide—we have offices in about 24 countries. Now the personnel at those offices can access and distribute product and sales information electronically, where as we previously had to print it and ship it around the world. By using our internal network, we've been able to substantially reduce costs for collateral. These same groups—all over the globe—are now able to get their information within minutes as opposed to days. We can reach around the world with our network and distribute information that keeps everyone up to date. How do you measure the value of that? We feel that the money we are spending is giving us back tremendous improvements in internal communication. How much is that worth to a company? I don't know, but I do know it is worth a great deal to us."

Cutting Costs with the Web

At Silicon Graphics, the company's external Web site, *Silicon Surf*, is delivering similar benefits. "We measure the traffic to *Silicon Surf*—the number of people who access the site every day," Farris remarked. "We've found that we have about fifteen thousand visitors a day from sixty different countries. And, on average, our visitors download about eighteen gigabytes of information daily. We estimate that the cost of creating, printing, and distributing that material in hard copy form would be about one hundred thousand dollars a day. So, not only is our reach extended—we're coming in contact with fifteen thousand people a day with whom we might not otherwise make contact—but were also avoiding a huge expense in the printing of hard copy collateral. It is a tremendous cost savings. Though *Silicon Surf* is an external Web site, its success can easily be applied to the

The Story of the Three Bears

An analysis of Silicon Graphics' World Wide Web Business

I split Silicon Graphics' Web-related business into three categories. Inside the company we call them Baby Bear, Mama Bear, and Papa Bear. The Baby Bear Web business is selling Indy workstations as home page servers and Web site development stations. The average Indy wokstation runs about $10,000. We're selling Indy workstations at a rate of thousands each quarter.

The second category, the Mama Bear business, is focused on using the Web to transact business. More and more companies are using the Web in this way, and it's what the popular press is writing about. The systems involved range in price from a few hundred thousand dollars to several million dollars each, and the users possess a great deal of technical sophistication. The applications being developed on these systems are really being done for the Web, rather than for the computer systems themselves. And they are typically being connected to powerful databases from Oracle, Sybase, or Informix.

These are very interesting applications for us. Our business in this sector is increasing even more dramatically than in the Baby Bear business.

The third category, the Papa Bear business, takes place inside the firewall, where companies are developing Intranets. That's also a very big business for us. To develop an effective, high-quality Intranet at a company the size of ours requires sophisticated equipment, such as our WebFORCE computers, and a systems architecture that will enable this graphical, processing-intensive approach to corporate communications. Companies from around the world come to see the Silicon Graphics Intranet and learn how they can create a similar company-wide Web. Those visits are one of the best ways we have of developing new business relationships.

— Ed McCracken
Chairman and CEO
Silicon Graphics, Inc.

economies of scale that can be realized through an Intranet.

Speaking of costs, what sort of expense can a company expect when it decides to create an Intranet? "The beauty of a Web browser (such as Netscape Navigator)," Farris said, "is that it can run on any type of machine. You don't have to have a high-end machine to run it. That means that companies can leverage their existing technology investments. And this is the thing that is hard for many people to believe: in addition to the easiest way to implement things, implementing an internal Web is also the cheapest, because of its ubiquity across computing platforms. The Web is an information-processing-intensive application because you are essentially paging through information—sending pages back and forth that are full of text and images. And because of Silicon Graphics' visual computing heritage, it happens to be something at which our systems excel."

Security Concerns

As more information becomes readily available on line to more people, security issues related to the Internet have fueled headlines, movies, and best-selling books. At the same time, Intranet Web technology evolved rapidly to increase the measure of security. An internal Web, Julie Farris said, "just happens to be another communications medium. To the extent that the data in your Finance Department's computer system is secure, publishing it on your company's Intranet will not make it any less secure. The firewall technology that you already deploy to keep people out of your company's existing network will apply just as well to your internal Web. The firewall functions at a network systems level. Your company-wide Web is a protocol that rides above that."

Lilly's John Swartzendruber said that Intranet security has been a concern at his company, though the source of concern is frequently a misunderstanding of how an internal Web functions. "There has been a little bit of concern. You know, people read about the Internet and how it is a non-secure environment. And sometimes they assume that because we are using the Web technology internally, we are therefore using the Internet as a backbone, but that's not how an Intranet works." Indeed, an Intranet needn't have any connection whatsoever to the Internet, though most companies, including Silicon Graphics via *Silicon Junction* and Lilly via *ELVIS*, offer Internet access as a convenience to their employees.

At Silicon Graphics, "the Network Services Group is chartered with architecting and maintaining, to the utmost degree possible, the security of our corporate networks," Dietrich said, "And the group employs various software technologies to do it. It is a highly specialized

group that understands its own techniques quite well, and is very effective. Of course, we also monitor our network traffic on a regular basis. I am not aware of any problems that we've had thus far (related to breaches of network security)."

Corporate Culture and the Company-Wide Web

The Internet, most would agree, is changing world culture everywhere it plays a part in society. Intranets, on a much smaller scale, are likewise bound to affect corporate cultures. And, response within companies that implement an Intranet has been overwhelmingly positive. "When people see our Intranet for the first time," Julie Farris says, "they're shocked and amazed that we virtually run the entire company on it—especially when they find out that nine months ago, for the most part, there was no internal Web."

"Sure, there have been some cultural changes at Lilly due to the Intranet," John Swartzendruber said. "Since we are a multinational company, this has made people at one location much more aware of what goes on at other locations, and because of our cultural diversity, this can raise interesting issues. Overall, I'd say we've had tremendous acceptance of this. People really enjoy it."

Only for the Techno-Savvy? No Way!

Julie Farris finds that "once most people see the tools and the simplicity of the model, they very quickly understand how easy this is to do." It's important to point out that its not just large companies who are taking advantage of this technology. Many small and medium-size firms have Intranets."

"At our company, the people in the finance organization took it upon themselves to sit down and completely educate themselves on the Web, and they're now using the Intranet extensively. Keep in mind that these are not technical people, even though they happen to be working for Silicon Graphics. Their expertise is not computers or software, it is finance."

Simply a More Compelling Way to Work

The rapid development of Intranets signals a profound improvement in the way enterprises manage internal infor-

TV on the Web Reaches New Viewers

What do KRON, KGO, KQED, KPIX, KICU, and KBHK have in common? Each of these Bay Area television stations now have homepages on the World Wide Web. In addition to news and local programming, these stations are providing special services—such as KPIX's remote control camera which delivers panoramic views of San Francisco, and KRON's intimate biographies of reporters and anchors.

KRON, an early adapter of Silicon Graphics WebFORCE technology, is viewed as a leader in the way it has embraced the Web. The station made a hefty commmitment early on, hiring Silicon Graphics consultants for technical and creative input, and then a staff including a full-time Webmaster to maintain the site.

KRON uses a Silicon Graphics Indy Authoring Station to create its news and information and a CHALLENGE S server to power the site. The attractive homepage interface resembles a TV control room from which you can link to sites for NewsCenter 4, *Bay Area Backroads, The Next Step, and The Know Zone.* Users can also check out programming schedules and peruse news and weather briefs. One link, *Talk Back to NewsCenter 4*, lets viewers provide feedback.

KRON's efforts have really paid off. On its first weekend, the Web site had 160,000 hits. Since then the figure has averaged 300,000 per week.

All the stations have plans to expand Web services and another station, KTVU will soon join the pack. Tune in on the Web and see for yourself:

KRON: http://www.kron.com

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KICU: http://www.xm.com/kicu/sportsfocus

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— by David DiNucci

mation, and perhaps even in the way they view their employees. Dietrich believes that it is indicative of a move away from hierarchical corporate cultures toward more egalitarian, progressive organizations, where sharing of information is seen as fundamental to success. "At Silicon Graphics," he says, "we definitely believe in empowering people, because we feel that only highly informed employees are able to do a good job and continue to be motivated. Our management believes that to have a highly motivated, well-educated work force, you must make available abundant information—it enables people to see the big picture. The nature of World Wide Web technology is that it encourages more access to information, which, we believe, is the most productive way to operate a company—as opposed to limiting the information available to employees.

"I wouldn't say that each and every piece of information this company generates is available to each and every employee," Dietrich added. "But generally we try to make more information available rather than less. And our employees, by the way, are the kind of people who are always asking for more and are eager to share what they know. The fact is, the Intranet better equips us all to do our jobs, because, technology aside, it's simply a more compelling way to work."

For more information about the Silicon Graphics WebFORCE family of computer systems designed specifically for creating and operating high quality Web sites, visit the WebFORCE Web site at http://www.sgi.com/Products/WebFORCE/, or e-mail webforce@sgi.com. ★

Douglas Cruickshank is a freelance writer and former editor of IRIS Universe, the Magazine of Visual Computing.

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Catching the Wave

An interview with Silicon Surf's Anita Schiller

By Doug Cruickshank

As odd as it is to say about something with such an aura of the new, for years now *Silicon Surf* has consistently appeared on various "Top 100" and "Best of" Web site lists. At two years of age, it is one of the oldest commercial sites on the World Wide Web and still one of the most popular. Its content ranges from the entertaining to technical data on the world's most advanced visual computing systems. Not surprisingly, *Silicon Surf* is a visually striking site which is also easy to navigate —a marriage of qualities that can challenge even the most expert among today's Web content creators.

Anita Schiller, director of Electronic Marketing for Silicon Graphics, has been a driving force behind *Silicon Surf* since its inception. Along the way, Schiller has learned a thing or two about what works and what doesn't on the Web. In the following wide-ranging conversation she discusses her ideas on how businesses and other organizations can best utilize the dynamic global network that is transforming commerce and communications.

IRIS Universe: First of all, describe what you do.

Anita Schiller: My job is to help Silicon Graphics fully integrate the Internet, and specifically the World Wide Web, into its marketing operations. That means determining the best way to use this extraordinary technology and incorporate it into our public relations, marketing communications, and communications with our customers, analysts, the press, and the entire Internet community.

IU: How did *Silicon Surf* come about?

Schiller: When I joined Silicon Graphics in 1987, long before the World Wide Web came into being, I was in the Customer Support Division and working in the Marketing Department. We were trying to figure out how to help customers be more self sufficient. We wanted to provide them with on-line tools for trouble-shooting equipment problems. Much later, when the Web came along, it was a natural thing for the people in Customer Support to explore the Web technology and how it could be used to help our customers. We pulled together a small team and launched *Silicon Surf* in March 1994. Still later, we reorganized and brought the *Silicon Surf* team into Corporate Marketing because we realized that what had been launched as a proof of concept project was a very viable means of communicating with our customers, and it could also be utilized as a marketing communications vehicle.

IU: Did the growth of the Web catch Silicon Graphics by surprise?

Schiller: In all honesty, we didn't have a crystal ball. However, we were one of the very first commercial entities on the Web. The site was something that we first tried as a means of helping our customers by putting them in the information loop, but we had no way of knowing that we were going to have fifteen to twenty thousand visiting *Silicon Surf* every day. We didn't anticipate that level of success and interest.

IU: Obviously, when Silicon Surf was under construction, Silicon Graphics had the best technical expertise and hardware. What about smaller, non-technology companies? What does it take in terms of money, time, and expertise to create a high-quality Web site?

Schiller: That's a very complex question and any answer will vary according to what the company is trying to accomplish with its Web site. Naturally, the amount of time and money it will take is directly related to the complexity of the site you are building. At present, we have about fifteen people working full time on *Silicon Surf*. It fluctuates—we hire contractors on occasion and then that figure may grow to twenty. As for professional expertise, and assuming you're launching a relatively sophisticated site, you're going to require graphic design, a variety of creative talent, personnel with strong editorial and writing skills, people to do the HTML (HyperText Mark-up Language) coding, and, in some circumstances, individ-

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tent you've looked at or lets you personalize your view so that on subsequent visits you only see the sections you're interested in.

How you respond to incoming communications is crucial. Most Web sites have a way of contacting the Webmaster, but the Webmaster, or somebody in the company, better be prepared to respond. You can't open up the funnel of communication if you're not going to follow up, because people will become frustrated very quickly by your lack of response, and that can be extremely damaging to a company. Remember this is the Internet and people are not shy about telling, not one person, not ten people, but everybody who happens to read a particular news group, that you've been unresponsive as a company. The other thing is that content is king, and I think it always will be. Being able to provide some unique value to your customers via this medium is essential to your success. It is not about just printing brochures electronically. You've got to offer people more. You must give them some other reason to be there.

IU: Do you place a great deal of emphasis on the content of the site changing frequently?

Schiller: It depends. If you're Encyclopedia Britannica you're probably going to change as often as the Encyclopedia Britannica changes. On the other hand, in the case of a company such as Silicon Graphics, if all we ever did was put up our product brochures, and only changed our site when we launched a new product, we probably wouldn't be getting the kind of traffic that we're getting today. I am not necessarily an advocate of changing a site every day. With some notable exceptions, I don't think we're at a place yet where people are logging onto sites every single day. I think if we change too much on our site on a daily basis, we may miss some of our audience. One of the struggles we're having is figuring out the right balance. Changing content every three months is definitely too long for a commercial entity. So is once a month. But changing it every day is too short, unless you're doing daily news, running a search engine, or something of that nature.

IU: What about international concerns? Anybody, anywhere, who has Internet access, can visit your site. What do you consider in relation to language when you're potentially speaking to an audience that communicates in a hundred different languages?

Schiller: First, you have to consider how many of your customers are speaking those other languages before you go off and invest in doing a Kanji site or one in French, Spanish, Italian, or whatever. But let's assume that you do have a global business and you're a U.S.-based company. In that case you need to be concerned about not presenting a U.S.-centric view. Don't alienate those other companies or individuals who now have access to your information—people who, in the past, only had access to information about your company in their language. Now, all of a sudden they are reading your materials in English, which may be a very different picture than what's been presented by your local partner in their country. Generally, though we haven't always been entirely successful, we've tried to stay away from language that's full of colloquialisms which nobody outside of California would understand. We've also begun to build sections within *Silicon Surf* that are specific to different countries. There is now a French home page, an Italian home page, and a United Kingdom home page, and over the next few months several more country-specific home pages will be added. Those pages are in the appropriate languages, and they describe local events and issues that customers in those countries will find of interest.

IU: And what about the security issue?

Schiller: We're concerned about security but not overly concerned about it. I'm more worried about people using cel phones than I am about them using e-mail. When you start conducting sales over the Internet in which people give you their credit card number it is an issue. On the other hand, people have been giving out credit card numbers over the phone for years and handing them to waiters in restaurants, or tossing the slip after filling up at the gas pump. Certainly we're concerned about security on the Internet, but we're less concerned about that than about many other business processes.

IU: What other issues do businesses need to consider when conducting electronic sales?

Schiller: Conducting electronic sales via the Internet translates into introducing a new sales channel. So, you need to think about channel conflict. When all of a sudden you offer your products to virtually anyone, anywhere in the world, you create a gray market that can potentially compete with your smaller markets and your sales force. You also must consider global pricing. It's possible that due to a variety of reasons you may have different pricing in different parts of the world. You also may offer different products. This is certainly the case with automobile companies and, of course, many other enterprises. To avoid confusion, be clear about what you offer, and what its price is in different countries. Anticipate your customers' questions (many sites feature a Frequently Asked Questions or "FAQ" section). In some cases, where there are great price or product differences, it may be appropriate to explain why. Overall, keep in mind that doing business on the Internet is in many ways like doing business anywhere else. Wise companies make it easy and pleasant for customers to do business with them. ★

Douglas Cruickshank is a freelance writer and former editor of IRIS Universe, The Magazine of Visual Computing.

SiliconStudio... The First Integrated Digital Production Environment

By Steve Geissen

Today's entertainment industry professionals are more technologically sophisticated than ever before. But given the choice, most of the creatives in the entertainment industry would prefer to focus their energies on their art, not the technology that is used to create it.

Unfortunately, as digital technologies have become more widespread and complex, entertainment professionals have found themselves spending increasing amounts of time attempting to manage their digital content and evolve their production processes.

Having worked closely with entertainment industry customers and partners for more than 12 years, Silicon Graphics recognized that entertainment professionals were in need of a solution that would allow them to reduce the overhead that is often associated with new technologies.

SiliconStudio, the Silicon Graphics subsidiary that focuses on the development and delivery of technology for the entertainment industry, sought to solve this problem by creating a digital studio architecture that would integrate key technologies in a comprehensive production environment. The company envisioned an environment that would be based around analyses of real-world workflow in the entertainment markets and which would link all phases of the production process.

The result of the company's effort is the development of SiliconStudio, a strategic open architecture for building digital studios. The SiliconStudio delivers an integrated digital production environment for the entertainment industry.

Unveiled in early March, SiliconStudio is based around the StudioCentral family of visual asset management solutions, the FireWalker 3D authoring system, and the StudioLive Internet-based studio services network.

"The SiliconStudio architecture will greatly enhance the way entertainment content is produced, managed, and distributed," says Blake White, Director, Product Marketing, SiliconStudio. "In the digital studio, artists should be able to realize their visions and collaborate with each other efficiently, without having to be concerned with the technology. The SiliconStudio architecture automates repetitive tasks and greatly accelerates processes such as archiving, retrieving, and repurposing content. Perhaps the most important thing this architecture gives the customer is more time—time that they can devote to their creative work."

Current digital studio production environments are designed independently of each other, which results in inefficiencies and duplication of effort. Key functions such as story development, storyboarding, animation, production, and in-process approvals and budgeting are separate "island" applications at best. The SiliconStudio architecture provides a common foundation for creative applications that span every stage of the digital production process. It is designed to deliver media "at speed" to every creative professional's desktop.

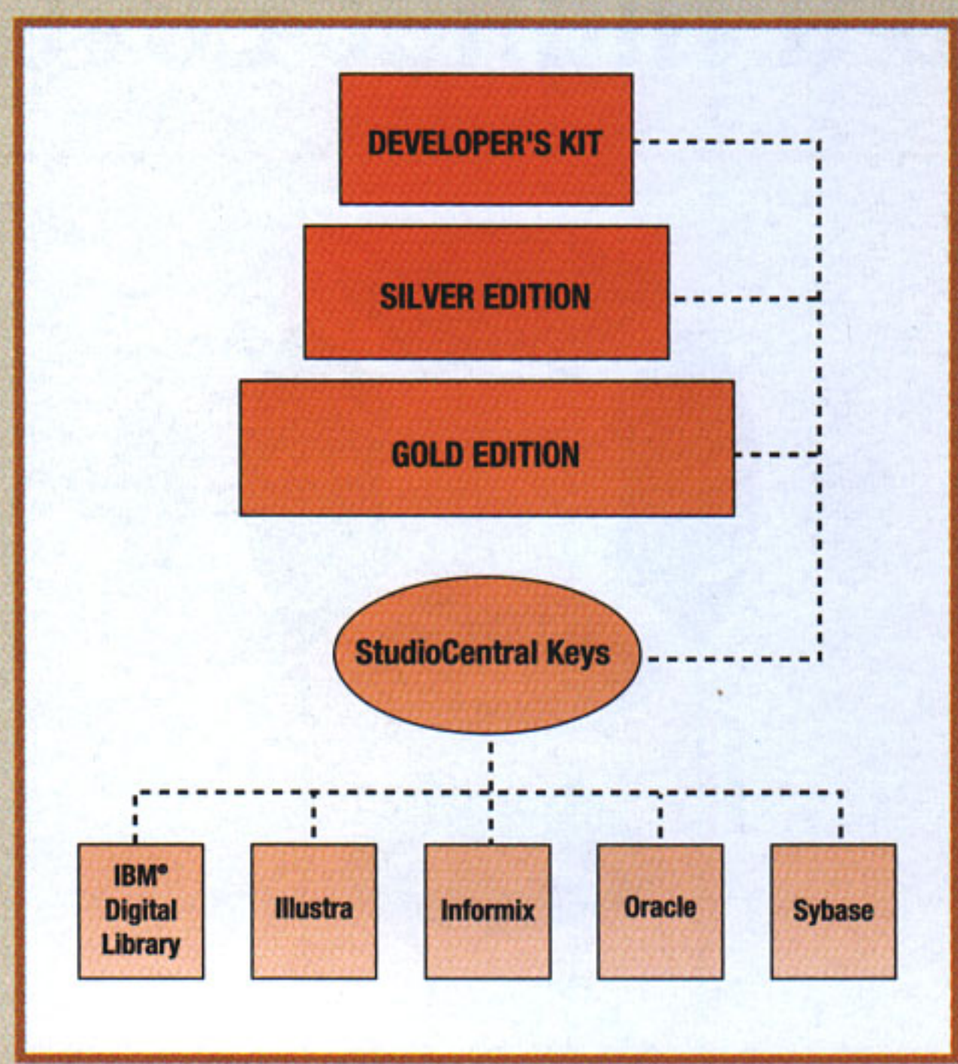
This integrated environment allows customers to author once and deploy content in multiple distribution mediums. Customers can integrate Silicon Graphics systems into their existing environments. Common APIs, libraries, data interchange, and file standards provide for a streamlined workflow.

The SiliconStudio architecture is being adopted by many of the leading companies in all of the entertainment markets, including film and video, broadcast, interactive authoring, music/audio, and cel animation.

Silicon Graphics and Apple Computer announced that Apple will support the StudioCentral asset management system, and will collaborate with Silicon Graphics to fully integrate Apple Macintosh systems into the powerful StudioCentral environment. The companies also announced that they intend to cooperate on better integration between their respective digital media formats, and that the StudioCentral architecture will support Apple's QuickTime data format. By focusing their efforts towards accelerating the development of technology for the entertainment industry, the companies will enable customers to more easily create integrated digital studios using a variety of technologies.

DreamWorks SKG was one of the first entertainment companies to adopt the technology. "The ability to move ideas, characters, and stories to many different platforms is part of the foundation we're building at DreamWorks," says Jeffrey Katzenberg. "As the first new film studio in sixty-five years, DreamWorks has set out to make technology our friend, and the SiliconStudio architecture is at the heart of what we're trying to accomplish."

StudioCentral: Unleashing the Power of Digital Content



StudioCentral, the first complete visual asset management system designed for the entertainment industry, has attracted widespread interest across the entertainment markets, White says.

Traditionally, tracking control and retrieval and reuse of creative content has been complicated, slow, and expensive. StudioCentral provides a much anticipated technology that speeds workflow by allowing professionals to catalog, manage, and access the digital media content in Silicon Graphics servers. The system delivers high-quality, real-time video on demand to the desktop over high-speed networks.

"Silicon Graphics and other companies have given artists the visual computing tools they need to create great content," says White. "Now the issue has become how to manage the enormous amount of digital content that a company generates. Among other things, an asset management system allows the customer to use powerful search functions and quickly find and browse the files they need. They don't have to waste time searching through traditional tape or film libraries, or looking through collections of files they don't need."

The StudioCentral product family runs on Silicon Graphics systems over networks within and between studios. Asset management systems currently fall into two categories—end-user applications and database systems. Applications such as Cinebase provide powerful tools for cataloguing, searching, and browsing. Database solutions such as Illustra provide developer's kits so custom applications can be created. StudioCentral server software serves as a bridge between these solutions and provides a database-independent open architecture.

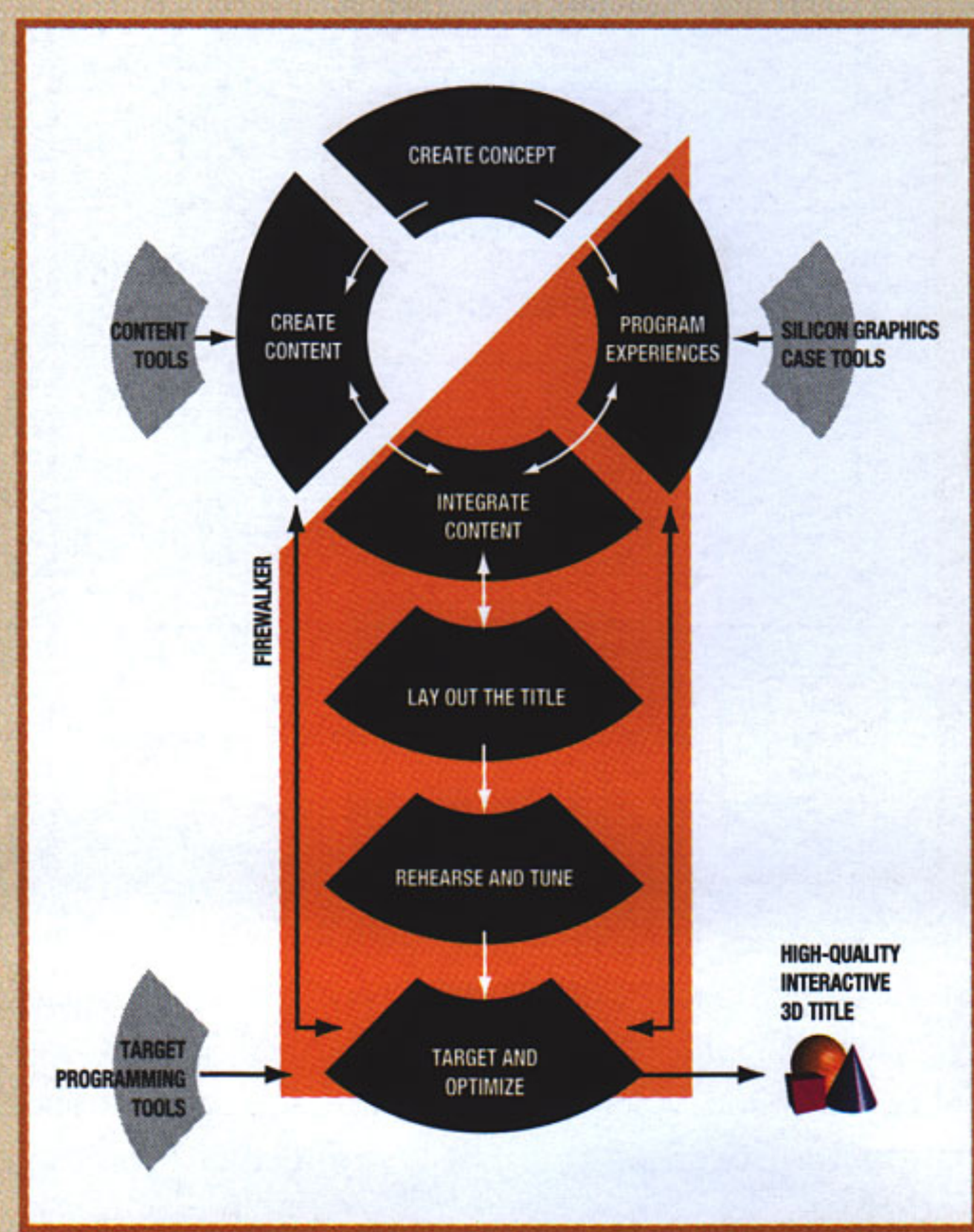
"StudioCentral can turn cost centers into profit centers," says Dawn Danaher, manager, Digital Assets. "The system not only protects and preserves valuable content but it lets assets be reused for new and profitable purposes such as licensing, merchandising, and repurposing of content.

"For example, a film studio could use the system to repurpose content for foreign distribution, advertising campaigns, and promotional items. With this technology, the studio could not only quickly find the content they need and realize huge time savings but also determine if there are legal restrictions associated with their use of content."

The visual asset management system is at the heart of the production process. "For example, saving a file into the asset management system is as easy as saving a file to a hard drive," Danaher says. "This is a technology that every member of the creative team can use, and it allows content to be easily shared among workgroups. Companies can increase their revenues by using it to streamline the production workflow."

FireWalker: Taking the Creation of Interactive 3D Titles to a Higher Level

FireWalker is a powerful authoring system that enables the developers of interactive 3D titles to accelerate production and enhance the creativity and quality of their titles. It is designed to improve the interactive title development process at virtually every stage, from prototyping through title optimization.



With FireWalker, game developers will have the technology they need to reduce production costs and create characters with more lifelike behaviors. The system allows creative teams to develop new titles on Silicon Graphics workstations and target the finished games and titles to multiple platforms.

FireWalker provides user interface tools for easy media integration, fast 3D world composition and interactivity tuning. It offers a unique set of technologies that allow developers to apply advanced behaviors to characters.

FireWalker allows for real-time playback of the title at any point during the production process. Instead of working in isolated units, all members of the team can rehearse the title at any point during the production. The graphical interface allows title designers to "drag-and-drop" each element directly into the title and accurately position elements in the scene without the need to program.

"Firewalker's quick prototyping capability will fundamentally change the way we organize our development staff. It can currently take as much as a year and a half before we can field test games. With Firewalker, it may now be possible to test within months. The fact that Firewalker prototypes can become the working title is yet another time-saving benefit." said Mark Pierce, Sr. V.P. and Executive Producer, Coin-op Product Development, TimeWarner Interactive.

SiliconStudio also announced that Sega Enterprises Ltd. of Japan will participate in the FireWalker Alpha Test Program. Other alpha testers include Time Warner Interactive, Rocket Science, SegaSoft, and MediaX/Toonsmiths for the Grolier Interactive product, Surf and Destroy.

"Currently it can take one to four million dollars and twelve to eighteen months for a company to develop interactive 3D games," says Jeff Benrey, manager, Creative Products Marketing, "By helping companies spend less time on overhead and more time developing high-quality titles, FireWalker can have a profound effect in this market."

"Initially, we expect that the game and entertainment market will have the most interest in FireWalker, but over time we believe the edutainment, multimedia, and interactive information markets will demand the same levels of 3D interactivity as video games," Benrey says. "In the future, FireWalker will likely also play an important role in title development in these markets as well."

"Have you ever seen bubbles come out of a Honda? The director did from 3,000 miles away."

- Michael Crapser,
Executive Producer,
Rhythm & Hues, L.A.

Los Angeles

Sprint Drums®

the first networked production community

New York

The idea was simple: Take a Honda car with a sunroof, open it up and make bubbles come out of it. Doing it, however, was another matter.

"Henry Sandbank, of Sandbank Films, shot the car first. Our job was to put the bubbles in later," says Michael Crapser, the executive producer at Rhythm & Hues charged with making it work. "But he couldn't be with us in L.A. to help choreograph the bubbles."

Luckily, the team had Drums, an interactive production tool that let them easily send images across the country to each other. In fact, with T-1 connectivity, the team was able to review the work simultaneously on both coasts. "With Drums, we got the director's input while he was in N.Y. and we were in L.A. with Rubin Postaer, the agency that created the spot. We were all able to see the footage at the same time. Nobody ever left home," says Crapser.

"We not only made bubbles come out of a Honda," Crapser adds, "but Henry uncorked it from across the country."

All of which led to a commercial deserving of the bubbly itself.

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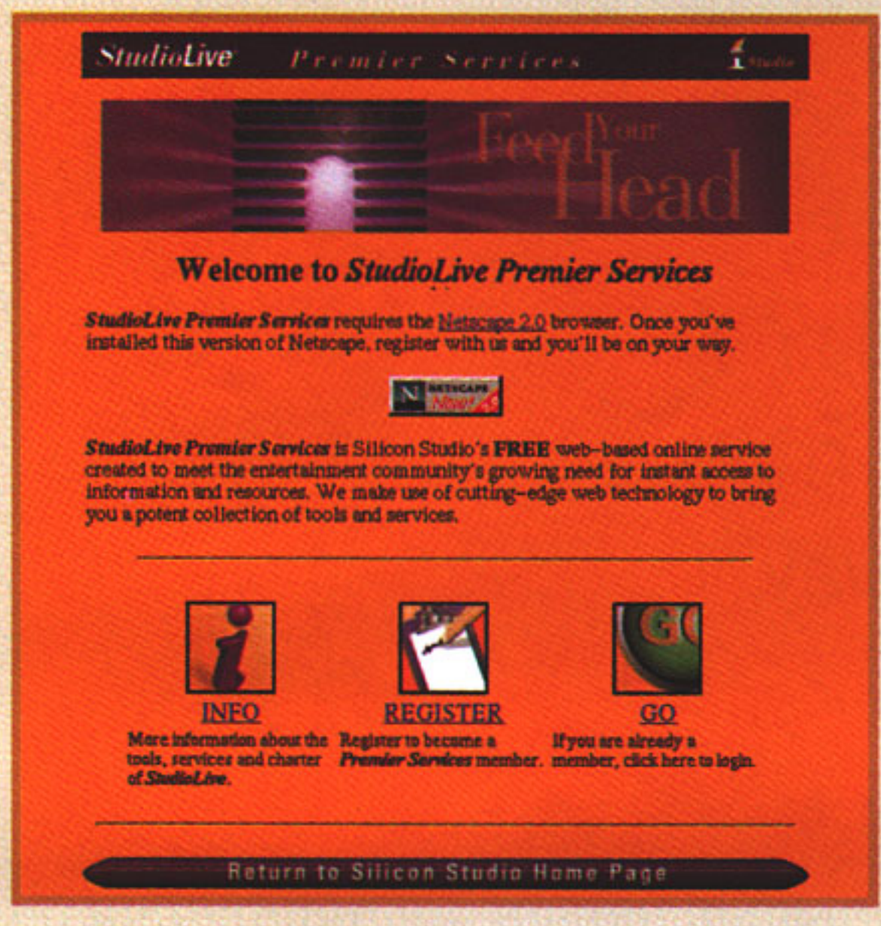
StudioLive: Harnessing the Power of the Web to Build a Community of Interest



StudioLive is a new on-line service that uses the power of the World Wide Web to deliver timely news, information, and technical support on digital technologies to the entertainment community.

The service includes StudioLive Premier Services, which provides a suite of Web-based tools and information resources designed specifically for entertainment professionals.

StudioLive—accessed through the World Wide Web (http://www.studio.sgi.com), is open to the public and is comprised of such topics as "Technology Features" that explore entertainment technology; "News and Events" with key announcements and technology news from SiliconStudio; "Entertainment Solutions," which highlights leading-edge applications of Silicon Graphics technology in entertainment; and "Digital Gallery," a virtual museum of digital images, audio, and animation.

In addition, StudioLive Premier Services features several no-cost, subscription-based services to help subscribers derive the most value from the depth of resources on the World Wide Web.

"We're very focused on providing content and services that add value and are useful to the entertainment community," says Jan Tyler Bock, manager, Studio Services Marketing, SiliconStudio, "StudioLive has something to offer entertainment executives as well as creative and technical professionals. And we're very interested in receiving feedback on the offerings so we can continue to tailor the services to meet the needs of the community."

Subscribers to StudioLive Premier Services receive sophisticated Web-based applications, enhanced by a powerful user interface. The offerings include:

- Custom News, which employs powerful searching and filtering technology and allows subscribers to build a personalized newspaper focusing on the technology and entertainment news that is most relevant to them.
- Chat, a Web-based, real-time global text communication service that is delivered through Netscape Navigator 2.0 Web browser.
- Support, a service that provides easy and fast access to critical technical support information from Silicon Graphics, SiliconStudio associates, and public USENET newsgroups. It is presented through an accessible search interface.
- Conferences, a feature that brings scheduled "auditorium" events to StudioLive. Users can participate in forums with industry leaders in real time and join moderated discussions with industry experts and professionals from around the world.
- Connections, a service that contains interactive directories of the entertainment industry's best and brightest talent and resources. Connections allows users to quickly locate and contact potential customers, clients, or talent. It contains company information and individual bios, display space for an ad, and a digital portfolio for work samples like animations, video and audio clips, and images.

StudioLive leverages WebFORCE servers and other Silicon Graphics technologies to create a focused global community of interest that makes use of the latest Web innovations. ★

Steven Geissen (geissen@neosoft.com) is a Houston-based writer specializing in technology.

Silicon Studio Training Center

The demand for computer graphics skills has artists, technicians, and executives knocking on the door of this state-of-the-art learning facility.

By Ron Magid

Maybe it was a metal man morphing relentlessly into a series of assassins in *Terminator 2* or the T-rex bellowing in rage at his human prey in *Jurassic Park*. Whatever the impetus, computer graphics are redefining the way audiences look at films, television, and a myriad of other entertainments, and creating undreamed-of employment opportunities.

Today, there is virtually no better way to get into the entertainment industry than through an understanding and application of computer graphics. There just aren't enough digital artists to go around, and people with training are routinely pirated away from one company to another.

A new generation of computer artists and technicians experienced in using Alias|Wavefront software on Silicon Graphics Onyx and Indigo^2 workstations is needed to fill the constant demand for effects on film and television.

But, like so many things in the entertainment business, breaking in has often been a frustrating catch-22: computer graphics artists needed hours of experience before they would be hired, but the only way artists could get that experience was to work on a film or television project. Until now.

Since it opened in May 1995, Silicon Studio Training Center has offered a refreshing alternative to that scenario—an in-depth curriculum that teaches would-be CG artists how to use the tools to model and animate characters, and then enables them to log enough hours to create a portfolio of work, and, more importantly, to become totally comfortable with the electronic palette of computer effects. Classes range in cost from $395 for introductory courses to $2,000 for advanced editing and compositing classes.

Wired for Success

The exterior of the Silicon Studio Training Center in Santa Monica's downtown business mecca looks deceptively retro, but inside, a cool blend of high-tech shapes, brickwork, and abstract paintings define a learning arena where the mold has been broken and restruck for the burgeoning digital age. In the foyer, within a glass case headlined "Industry Opportunities," ads from Warner Bros. Digital Studio, Dreamworks Interactive, Square LA, and JVC, among many others, beckon the emerging artists and technicians of Silicon Studio.

The bulk of the space is devoted to the school itself, which resembles a digital village. Three intimate classrooms provide the nexus of educational environments for the center. All three classrooms are equipped with LAN connections to an Onyx supercomputer and CHALLENGE server, T1 access to Sprint/Drums/Internet, and a full range of software applications and projection systems. The largest room seats 12 for hands-on work with Silicon Graphics Indy workstations, 24 for information-only seminars, and is primarily used for more general technology classes for the people providing technical support for CG artists.

The two eight-seat classrooms, outfitted with Indy and Indigo^2 workstations respectively, are used for intensive one-on-one classes in 2D paint and 3D modeling and animation. Students can learn the hottest software packages including Alias

PowerAnimator, SideEffects Prism, and Wavefront Explorer. Each student works on his or her own workstation, equipped with playback monitors. The instructors can either project their work above the classroom on an overhead screen, or the work of any student from any workstation.

"It's designed to be flexible, which allows for sharing of ideas," says Wendy Chin, the center's manager, who's worked with Silicon Graphics for several years on the training and technical side. "These rooms also offer additional audio and editing capabilities, and feature full videodecks which have the ability to input and output to Beta or VHS tape, also known as demo reels, which are critical to getting work in the entertainment industry. People don't just carry a resume anymore, they must also have a demo reel."

The classrooms surround a central kitchen/meeting area, suggesting a townsquare, where students can grab coffee or prepare meals—a testament to the kind of intensive round-the-clock learning sessions in progress. "We anticipate people staying late," Chin smiles. "The industry often requires day and night scenarios and we wanted our students to get comfortable with that."

Comprehensive Curriculum

Silicon Studio's curriculum is broken down into three disciplines: creative, technical, and executive. "It seems like everybody fits into one of those three primary marketplaces," said Joe Takai, manager of Digital Content and Creativity. For the past eight years he's worked at Silicon Graphics in various capacities, prior to helping Silicon Studio develop its current curriculum. "While we offer introductory, intermediate, and advanced tracks in all three areas, our strongest offering is in the creative arena, including 3D modeling and animation, editing and compositing, and 2D imaging and paint. We also teach crossover studio and general technology classes which offer a sample of how multiple applications work together for solutions that require both types. We will offer lectures on concepts behind animation, but they aren't sixteen week programs where you learn all of the theory behind animation. If your goal is to be a great animator, there's a lot more you can learn from art classes and so on, but you can come here to learn an application and how it applies to animation."

A number of classes are taught in an immersion style, providing concentrated, hands-on experience for students. Immersion classes typically run from from 9 a.m. to 10 p.m.. There, students immerse themselves into the technology until the computer tools are no longer obstacles to creativity, but extensions of the user, thus breaking down the human/machine barrier. "It's a five-day class where you learn a tool all day, then that night you have the opportunity to try your own ideas and really stretch the tool," Takai says. "It's a great way to get experience with the tools. Experience is the hardest thing to get. You can learn a basic application, but if you can't log the hours, it's hard to get a job. If you take our immersion classes in combination with other classes, you're going to quickly log one-hundred hours of time. We also offer lab time on an hourly rental basis—you pay for as much time as you need. That experience and your demo tape make a good entré into an effects facility."

Some of the most exciting growth opportunities are occuring in the technical arena, which provides programming, networking, and storage support for CG artists. Trouble-shooting software bugs, managing system maintenance requests, software loading, and tuning machines to run as fast as possible aren't just necessities in the digital world: a fast system can give a facility a competitive edge over its competition. "People can't afford to lose one minute of down time," Takai insists. "There's a lot of folklore involved, and a lot of things get handed down from previous systems administrators to the current ones. Each facility runs its technical side a little differently, and that's its competitive advantage. Until now, this kind of knowledge was very hard to get."

In many ways, the executive arena is the most complex of all, because it's about managing the creative and technical sides. Silicon Studio offers valuable training in the whys and wherefores of computer graphics for traditional film executives. Recently, the Center entertained a group of vice presidents of production and post-production from a major studio that wanted to finesse how to budget film as it pertains to digital production. "We're getting out to the studios and asking what their needs are," says Kim Daus, marketing manager for Silicon Studio. "Our primary focus is to put together classes on managing human resources for production. In general, we teach people the

process, give them at least a day spent explaining what the tools are, what they're capable of doing, how they relate to each other. We hope to explain how the special effects needed for film and television translate into the bottom line of staff time and dollars. Accurate budgetting and scheduling is another area that can give studios a competitive advantage."

Learning from the Best

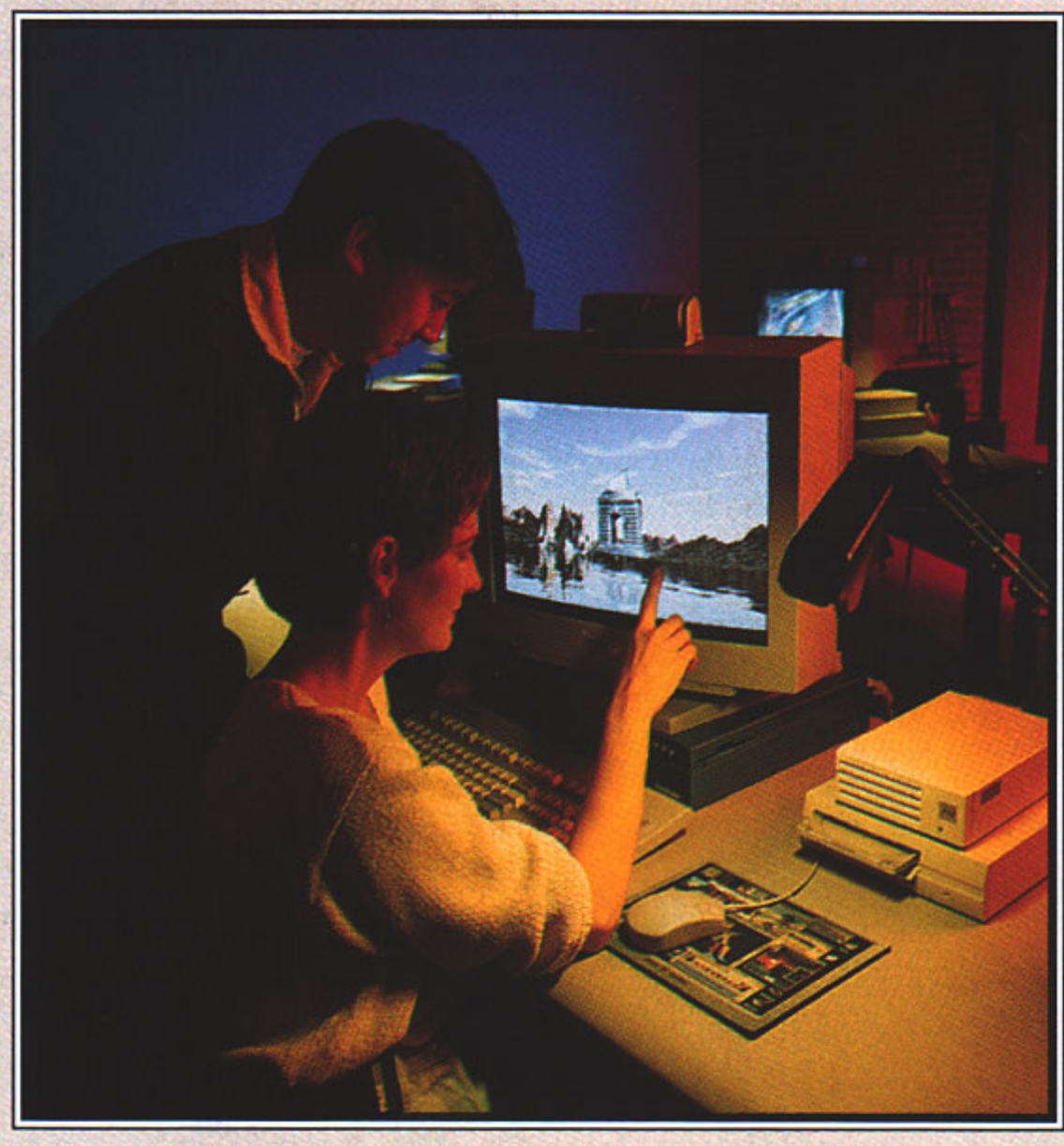
Half of the classes at Silicon Studio are taught by Silicon Graphics' creative partners, such as Discreet Logic, Side Effects, Kodak, and Alias|Wavefront, who take full responsibility for developing materials and training instructors. The other fifty percent of the instructors are largely effects professionals such as David Douglas, head of the matte department at Sony Imageworks; Laurel Klick, effects director of Acme Visuals and veteran of fifty major effects films from *Star Wars* to *The Terminator*; John Murrah, the technical supervisor for digital compositing on *The Mask*; and Illusion Arts' matte shot cameran Mark Sawicki known for his work in *The Shadow* and *Batman Forever*, among many others.

In another arena, Silicon Studio Digital Coffeehouse, students can interact directly with other top industry professionals on the heels of completing their latest blockbuster. Since the center opened in May, several effects professionals, including *Babe* Digital Effects Supervisor Scott Anderson, have fielded questions in this unique forum. "The idea is that someone finishes working on a hot movie, and then they come in here and share their experience with our students," Chin says. "It's great to get that dynamic set up." Takai agrees, "When you see an effect on film or television, how it's done is not written down in a textbook. We're trying to bring people in to talk about the effects as they happen."

The fact that Silicon Studio is attracting top effects professionals as teachers is one of many success stories Chin and Takai like to reference. Another is that since the center opened, more than 800 students have come through its doors. In the seven months Silicon Studio has been in operation, its mission has continued to evolve. Primarily focused on film and broadcast applications in the beginning, the center has been expanding its market segments to include game authoring—teaching people how to conceive a game and, once they've developed the story, how to use CG to visualize it. "We're working on a game authoring track to help students execute a story, storyboard a concept, or build digital sets for a gaming environment," Takai says. "We're trying to offer a perspective on the tools and the techniques and the marriage of those two, and how to get into the gaming business. Ninety percent of the creative portion of the catalog relates to publishing or film and television or game authoring."

CG Is the Future

In virtually any area of creative media today there are tremendous opportunities for people to enter the entertainment industry through computer graphics. And the technology is just going to become more pervasive, in both film and television. This technology will extend into corporate presentations and far beyond what we know today as special effects. Silicon Studio is dedicated to creating a forum in which students can study the techniques hands-on with the tools. "One of the primary reasons this center was opened was to help expand the market and fill those empty seats in the entertainment industry with newly qualified people so facilities won't have to steal personnel from each other," Takai says. "It's almost like if you understand the technology and can breathe, you can get a job. But we're hoping to build an innovative and refined technology that can be used across publishing, games, and all of the different digital areas."

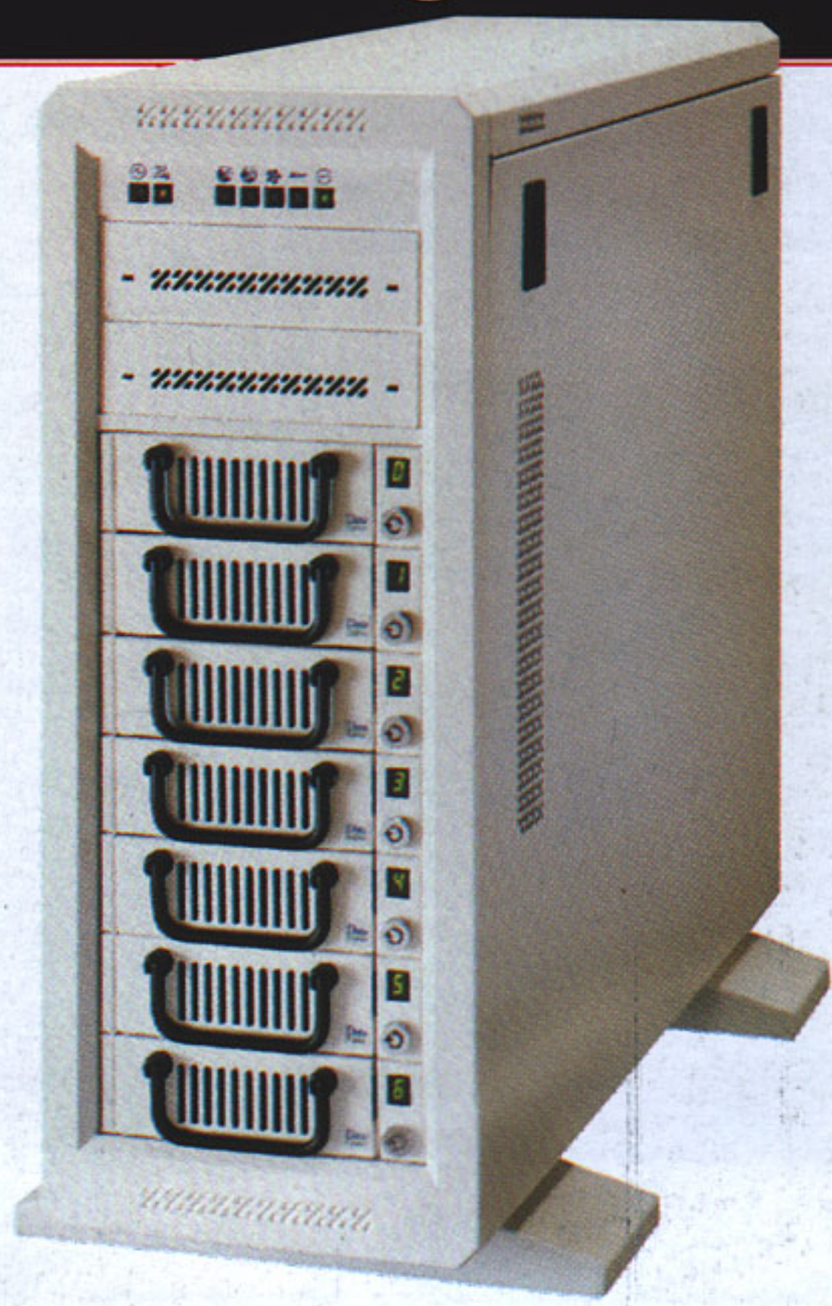


"What we're doing here is providing more than a training center," Kim Daus says. "It's more than just a place to go to listen to a lecture and watch a demo, it's about people coming to a center that's fully loaded with Silicon Graphics equipment and getting their hands on this stuff and experiencing it. We're trying to create a center where top of the industry instructors are teaching a professionally developed curriculum, so students can find out what's going on in the industry—from specific skills to who's who. We're looking at what's going on in the real world and trying to translate that into a learning experience."

For the Silicon Studio Training Center class schedule, call 1.800.S.STUDIO or see the online listing at http://www.studio.sgi.com/Training/Catalog/Schedule/schedMain.html. ★

Ron Magid is Special Effects Editor of American Cinematographer, Cinescape and i on Visual Computing *magazines. In addition to penning several screen- and teleplays, he co-authored the one-man play,* Once Upon A Midnight—The Confessions of Edgar Allan Poe. *He lives by the sea in Santa Monica, surrounded by his favorite monsters. He is just hooking up to email!*

Thinking RAID?



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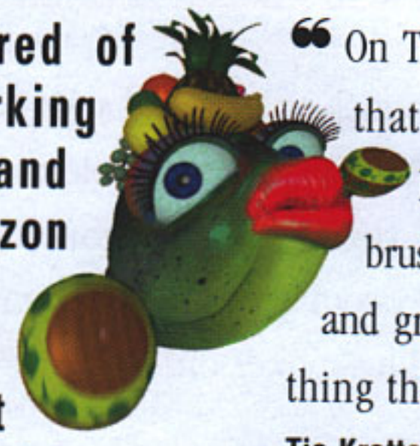
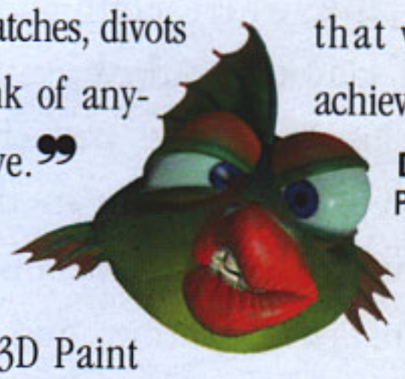


"On Toy Story... we've tried to get away from that incredibly clean and flawless look. I really like the idea of creating custom brushes in Amazon with scratches, divots and grains. I really can't think of anything that Amazon doesn't have."
Tia Kratter, Pixar

"It became clear from testing that there's no other paint system out there that would enable us to achieve comparable results..."
Dean Yurke, Head, CGI Department
Peerless Camera Company
(*12 Monkeys, Mary Reilly*)



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CIRCLE READER SERVICE CARD NUMBER 36

Tune in to TV and Radio Sites on the Web—Where Broadcast Has Entered a New Age

by Wendy Maurer

It all began in 1901, when Guglielmo Marconi sent the first wireless signal across the Atlantic ocean, ushering in the golden era of radio. Over the next 50 years, broadcast technology evolved at a relatively moderate pace. The radio networks turned on in 1920. Television arrived in 1941. Color in 1954. Satellite in 1957. After that, broadcast technology didn't change much, except for the creation of smaller radios and televisions, and improved reception. Now the Web is causing a broadcast revolution. Here are a few examples:

http://www.studio.sgi.com/studiolive.html

A Studio of Live Portfolios

Looking for a producer or director? Maybe voice talent? Check out StudioLive, the entertainment community's premier Web site. The Connections section contains individual and company bios, plus digital portfolios—the resumes of the 21st century. Choose one and thumb through work samples that include images, animations, video, and audio clips.

http://www.protozoa.com

Broadcasting Protozoa

Imagine interacting live with animated characters on the Internet—not with clumsy characters with the personalities of a pencil, but with 3D characters full of personality and realistic expressions such as blinking eyes, a smiling mouth, and a chest that raises and lowers with each breath. The Protozoa Web site gives you a window into the future of real-time animation on the Web: broadcasting, interactive television, and games.

Here you can watch video clips of characterful creations using performance animation technology. The clips are hefty, but they're worth the download time. A worm, tired of playing it safe, bursts into spontaneous expressive dance. The loss of a contact lens provokes an existential crisis for a poor bewildered creature. Once the superhighway's bandwidth is super fast, who knows? You could talk live with Bugs Bunny about impending broadcast regulations. Or play a video game with other human players seen as complex characters. The future is limitless.

http://radio.aiss.uiuc.edu/~rrb/radio.html

Traditional Media and Associations

Many radio and television stations are now on the Web. The Airwaves Web site has a comprehensive list in its Media Section. Every station offers something different: programming schedules, news, and reviews; some even have audio and video clips.

The Airwaves Web site also has a bevy of other broadcast resources. Here you can search job listings for sound engineer, sales, and station manager positions. The Society of Broadcast Engineers link will help you keep pace with the rapidly changing industry through educational seminars, industry tours, exhibits, and conventions. The National Association of Broadcasters link has information regarding U.S. legislative, regulatory, and judicial representation in Washington, D.C. The Federal Communications Commission link has comments from President Clinton about the impact of current technology. The Airwaves Web site deserves a bookmark.

Wendy Maurer lives in a small fishing cottage in the hills of Sausalito and writes primarily about the Internet and other sophisticated technologies. If you know of a Website worth mentioning in Webography, send an e-mail to wendy@sirius.com.

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Modeler's Little Helper

Silicon Graphics' Principal Scientist Tom Davis offers programs for quick generation of simple 3D models.

Anyone who has worked with 3D computer graphics knows why Martin Newell's ancient teapot model still appears in modern SIGGRAPH papers—it is very difficult to generate 3D models. Lots of companies make lots of money selling 3D modelers because modeling is a hard problem, and requires sophisticated software. I've seen some 3D clip art, but it's hard to imagine that it can be as successful as 2D clip art since large 3D clip art collections might require terabytes (or even peta, exa, zetta, or yottabytes) of storage.

A worm model generated by one of Tom Davis' sample programs.

For many complicated 3D objects there's obviously no simple solution, but if I think back over the years, I can't count the number of times I've needed a model of a cube, sphere, cylinder, or some other similar "simple" object for my work. In almost every case, I just generated the object's coordinates (or wrote code to generate the object's coordinates) from scratch.

Libraries such as Open Inventor can be very useful, but I have found that often I either don't want to use the whole Open Inventor mechanism, or the data it provides is not in the format I want. What I need is a library intermediate in power between raw GL/OpenGL and Open Inventor.

A few years ago, I wrote the beginnings of just such a library to solve this problem and it worked quite well. It has a few interesting routines, and it is easy to extend. The source code, documentation, and a few example programs are available via public ftp from sgi.com in the directory graphics/lilhelper. The code is written in C, but written carefully enough that a C++ compiler can digest it. The example programs are, unfortunately, written using the old GL, but the modeling routines in the library are independent of the graphics in the examples. Having listened to too much Rolling Stones music in my youth, I called it "Modeler's Little Helper."

The basic idea is simple. Top-level routines each generate some solid model. The parameters vary depending on the object, but one parameter is common to all—a callback function. For example, the generate cylinder routine might take as parameters the height, diameter, and number of divisions along the axis, the number of divisions around the circle, and the callback function.

As it runs, each routine's code generates a series of triangles or quadrilaterals, complete with spatial coordinates, normal vectors, and texture coordinates. All polygons have the same orientation so back-facing tests to eliminate hidden polygons can be used. For each such triangle/quadrilateral generated, the callback function is invoked with the polygon's data. That's it.

The callback function in the invoking program can use the data however it likes—it can draw the object then and there, it can save the data in a display list, it can write the coordinates to a file, or it can modify the data and use it for any other purpose, graphical or not.

For example, I once needed PostScript code to draw an icosahedron, so I used a callback routine that wrote to a file two of the three 3D coordinates (x and y) of all the triangles with normal vectors pointing forward (with positive z coordinates). The x and y coordinates in the resulting data represent an orthographic view of the icosahedron in two dimensions, with hidden surfaces removed!

It is reasonable for the library to have different representations of certain objects. A sphere, for example, is usually represented by a latitude/longitude subdivision into quadrilaterals, but there are various triangular decompositions that have the advantage of being more uniform. There's no reason the library can't have many different sphere-generating routines.

Modeler's Little Helper contains not only the usual spheres, cylinders, boxes, platonic solids, et cetera, but it also allows users to define curves through 3-space and to generate "worms" around the curves. A worm is obtained by moving a polygon along the curve and perpendicular to it. The curves include cubic, Bezier, and cardinal splines, and piecewise linear curves. The illustration on this page is a worm model generated by one of the sample programs.

In addition, the curves can be rotated through space to form solids or smooth solids of revolution. There is also a routine to generate an arbitrary analytic surface given the coordinate functions and their various partial derivatives.

Finally, the library provides transformation functions so the objects generated can be rotated, translated, sheared, or scaled, as in any reasonable graphics library. These transformations alter the coordinates and normal vectors in the proper way. So if you need an oblate sphereoid (a smashed sphere, sort of like gouda cheese), simply provide a non-uniform scale in one direction and generate a sphere.

The distribution includes three example programs that illustrate various uses of the library, and they implement a trackball-like interface so you can view the solids from various points of view.

Even if Modeler's Little Helper isn't exactly what you need, you may find the ideas behind it useful in building similar sorts of libraries.

To get a copy of Modeler's Little Helper: Using ftp or a similar program, connect to the host sgi.com, and log in as "anonymous." Connect to the directory graphics/lilhelper, and get the file lilhelper.tar.Z, which is in compressed tar format. ★

Tom Davis (davis @asd.sgi.com) is a principal scientist at Silicon Graphics where he works as a graphics hacker and mathematician-gone-bad.

You say, Jumanji. I say, "Monkey funny."

By Kenneth Orville

Jumanji is the tale of a preteen boy, Alan Parrish, who finds an enchanted board game that sucks him into a jungle for 26 years and then spits him out again in 1995, where he discovers that everything he cares about is long gone.

But enough about him. Let's talk about me. When I was 12, the same thing happened to me, and I'm not kidding either. It all started when my friend Bruce Ericson came to school in a new pair of bell-bottoms. They had this Indian print on them, with stripes that sprouted little triangles and squares off each side running up and down the material. They were red, gold, brown, and black. And they were wild, man. They were cool.

Everybody talked about Bruce Ericson's new pants. And he wore them practically every day. Because Bruce (though my best friend) was not an innately cool person, this added an entirely new dimension to the Bruce Ericson persona. The cool dimension.

I was determined to revitalize my meager existence. "If all it takes is to buy some loud bell-bottoms," I thought, "I'm there." So off I went with my mom to JC Penney for the Pants That Would Change My Life: They were denim, they were rakishly belled, and they were red, white, and blue. "Patriotic," I mused. "Nice touch." The stripes ran vertically in a pattern that suggested if Betsy Ross were still alive in 1972, she may have considered some-

thing like this for an ill-advised redesign of the flag. (I could imagine the *Life* magazine cover: "Old Glory's Hip New Look: Oh Say Can You Sew?")

But the pants made a statement, and, a $10 bill was laid down in payment.

I'll never forget the first day. I can recall every "cool pants!" I heard as I made my way through the halls, returning a confident "thanks, I know" nod. Bruce was not happy. Sure, the buzz about his Indian-print pants had been waning for days, but this lumped insult right on top of his dwindling popularity. Our friendship suffered from the petty jealousies that only a cool pants competition can stir.

My life had changed, and I determined never to take the pants off again. My preteen brain even pictured, years down the line, a red, white and blue suit made from my bell bottoms—ideal for the office. These pants were my Holy Grail.

So, anyway, Alan Parrish and I aren't all that different. Except that director Joe Johnston (*Honey, I Shrunk the Kids*) made a movie about Alan Parrish's life story, and I had to squeeze my own story into this article about Alan Parrish's story. Look, ever since I lost track of those pants, it's been like this for me.

OK, so 26 years after Alan disappeared into a storybook jungle—complete with man-eating plants, black-hearted hunters, and mosquitos the size of footballs—a recently orphaned brother and sister (played by Kirsten Dunst and Bradley Pierce) move into Alan's old abandoned house with their aunt (Bebe Neuwerth) in tow. You know what's coming: the kids find the game, they start to play, and all *Jumanji* breaks loose.

Sound like fun? It is, for the most part. Based on Chris Van Allsburg's richly illustrated children's story by the same

name, *Jumanji* is a rollicking mix of childhood rites of passage, snickering New Age pop humor, and sentimental heartstring-tugging. Oh, and then there are the animals.

Although reliable Robin Williams and Bonnie Hunt star in the adult leads, the effects inspire most of the laughter, then excitement, then fear. It begins when the dice are rolled across the board game's lushly carved wooden surface. (The game, by the way, is cleverly designed—suitably quirky and exotic, like something produced a century earlier in the far reaches of the British Empire.) Each time a player takes his or her turn, the game pieces move on their own. And then a creepy poem appears in a smoky glass blob at the center of the board. Naturally, it's a movie, so nobody snaps to the meaning of the obvious verses until something deadly is within striking distance. For instance: "At night they fly, you'd better run. These winged things are not much fun." (Let's see...that *is* a toughie. By the way, anyone who hasn't thought "bat" by now should Go To Jail—and Do Not Collect 200 Rupees.) These foreshadowings are typically read in a questioning tone by Judy and Peter, as if they're written in Sanskrit and are completely undecipherable.

But everybody (even Judy and Peter) gets the point as they are inundated throughout the story by a succession of raucous and mean-spirited monkeys, a menacing lion, man-eating plants, mosquitoes the size of bundt cakes, rhinos, elephants, zebras, and pelicans. (Not a single aardvark, though, which was frankly a disappointment.) Nevertheless, the zoological attractions steal the show, as Visual Effects Supervisors Ken Ralston and the late Stephen L. Price mesh natural realism with animal movements that reflect a sense of literary fantasy. The animated lion looks so realistic it would look photographed were it caught in a still frame. But its movements are lilting, as the huge cat takes a grand circular staircase in two graceful jumps. The effects team at Industrial Light & Magic are going for a look that suggests the animals sprang from a children's book, and it works.

Some of the animated creatures have real personalities. The monkeys reminded me of the mischevious critters from *Gremlins*: half-speaking to humans but easily communicating with one another, they steal police cars, drive motorcycles, and shoot 12-gauge shotguns with ease. When you see them—either wearing cop uniforms or swearing at Parrish for disturbing their breakfast—you just have to laugh. Hey, they're *monkeys*.

ILM also did fine work transforming the old Parrish house into a jungle. Creeping vines and rainforest vegetation takes over the old place in less than a day. The animated vines are worse than snakes: they look like snakes and they slink like them, but the vines are smarter. And by the time one of the game board's poems warns of a coming downpour, you're not at all surprised to see the living room turned into an Amazonian monsoon, complete with deadly river animals.

Jumanji plays those tricks with time that cause little birds to twitter around your hairline if you think about them for any length of time. The movie does it to accomplish what most of us would recognize to be a happy ending. (Happy endings are next to impossible when horrifying jungle animals cause permanent and irreparable damage to sleepy New England towns.)

Ok, I'll just say it: unlike *myself*, who has had to endure more than two decades without my beloved red, white, and blue bell-bottoms, Alan Parrish gets his life back and, in fact, lives so happily ever after that you just about want to slap him.

Other than that—and the part about Alan's getting sucked into a board game and living in a jungle for 26 years—our life stories are exactly the same. ★

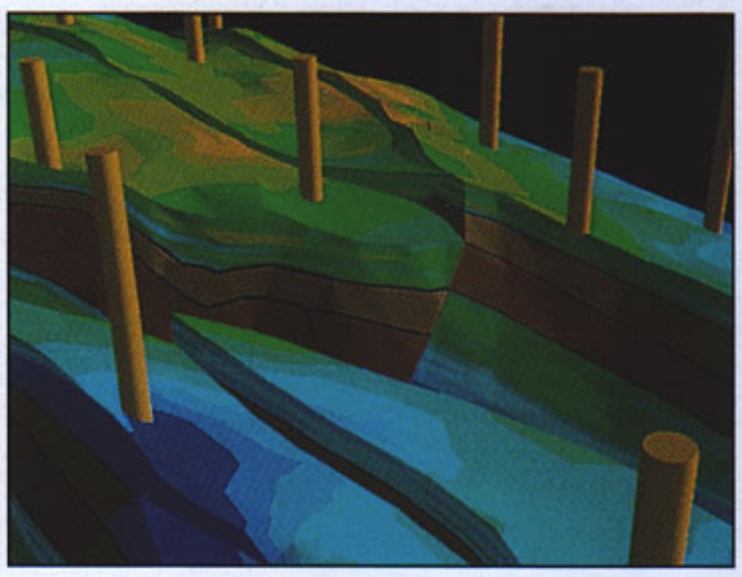
Kenneth Orville belongs to the ages and lives in Dunnville, Ontario, among other places.

CRASH TEST SIMULATION FROM EASI ENGINEERING

We begin this edition of Random Notes from the Field with safety first. EASi Engineering Inc., in Bingham Farms, Mich., has announced EASi-Crash, a software program that integrates the complete vehicle crash and occupant simulation process under a single user interface to dramatically improve productivity. The program can handle all aspects of model building, dataset preparation, results evaluation, report generation, and design comparisons, without having to listen to those annoying talking crash dummies. For information: (810) 901-4800.

EARTHVISION FROM DYNAMIC GRAPHICS

Now, a down to earth product. Dynamic Graphics, Inc., in Alameda, Calif., has released version 3.0 of its EarthVision integrated family of geospatial analysis software. EarthVision is used for earth science and geological research. The new version has a number



of improvements and new features, particularly in its Geologic Structure Builder, which is used to model complexly faulted subsurface structures. "With the productivity gains offered by our new automatic fault tree generation and horizon gridding routines, the technical enhancements to property distribution modeling, and the availability of cross sections and contour maps derived from complexly faulted models, EarthVision 3.0 ensures our market leadership and dominance in modeling complex geometries," says Art Paradis, Dynamic's president and chief executive officer. For information: (510) 522-0700.

VISLAB AND VISFLY PORTED TO ONYX INFINITEREALITY

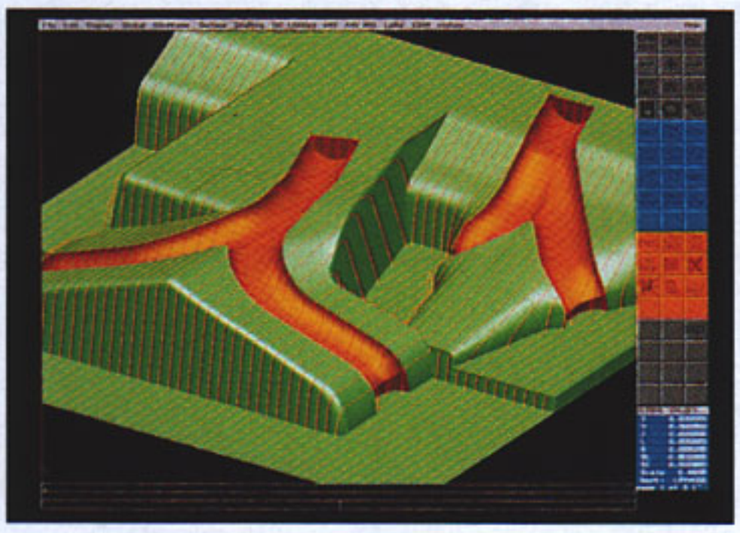
From the smart moves department, Engineering Animation, Inc., in Ames, Iowa, announced that it will port VisLab, EAI's flagship 3D animation software, and VisFly, the new interactive CAD program, to the new Silicon Graphics' Onyx InfiniteReality supercomputer. "Silicon Graphics has once again designed a breakthrough graphical computing platform. This new 'visualization' supercomputer will increase VisLab's rendering and animation performance, as well as VisFly's fly-through viewing capabilities," says Michael Jablo, EAI's vice president of software sales and marketing. EAI also announced that it has signed an OEM agreement with Structural Dynamics Research Corp. (SDRC), in Milford, Ohio. Under the agreement, SDRC will sell a number of EAI visualization programs, including VisLab and VisFly, integrated with the company's I-DEAS Master Series CAD/CAM/CAE software. For information: (515) 296-9908.

GRAPHICAL DESIGNER 2.0 FROM ADVANCED SOFTWARE TECHNOLOGIES

And while we're talking about new releases, Advanced Software Technologies, Inc., in Littleton, Colo., recently released version 1.2 of its flagship Graphical Designer program. Graphical Designer 1.2 significantly speeds the time it takes developers to create object-oriented software designs. The company says it is the only graphical-based design and software re-engineering tool to support a wide range of object-oriented design methods, including Rumbaugh OMT, Booch, and C Structure Graph. Graphical Designer 1.2 also features meta-CASE capability, so developers can create their own object-oriented design methods. The program starts at $4,999 for the first floating seat and then drops to $3,500 per floating seat for volume purchases. For information: (303) 730-7981.

CAMAND VERSION 10.0 FROM CAMAX

Camax Manufacturing Technologies, Inc., in Minneapolis, Minn., has rolled out a some new releases. Camax has released version 10.0 of its Camand software. Camand is a popular program for complex surface modeling 3-through-5 axis machining in mold and die work. It's also used for piece-part



manufacturing where complex, precise machine tool motion is required. Version 10.0 features enhanced surface blending, integration with a new surface machine module for higher NC program generation, data reduction and filtration, and a direct translator for files from Camax's ManufacturingExpert software. Camax also took the wraps off of its new SmartCAM Surface Machine Module (SMM). Developed as a stand-alone process, SMM uses the parallel and contour machining styles to provide high-speed toolpath generation. In its first release, SMM is integrated with Camand Version 10.0. For information: (612) 854-5300.

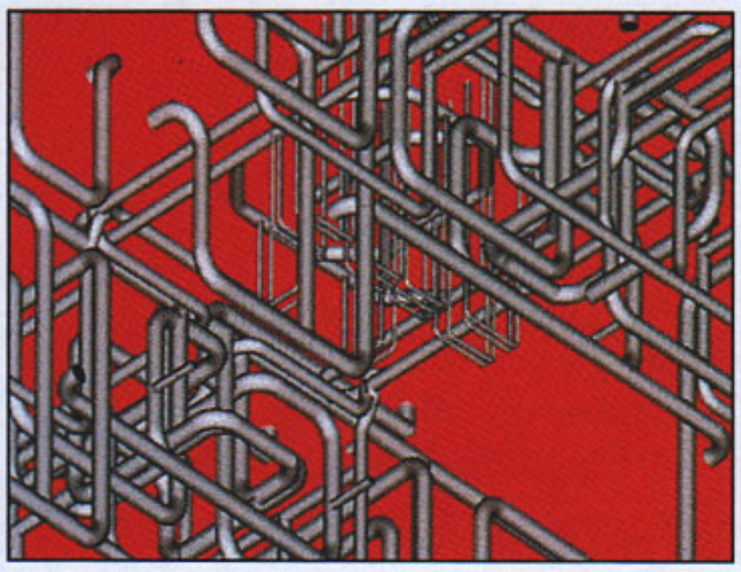
January was a busy month for Camax and for SDRC. That's when SDRC agreed to acquire Camax in a stock swap valued at $30 million. The deal calls for SDRC to issue shares of its common stock, in an amount to be determined on the date that the deal closes, in exchange for all shares of Camax. Once the deal is done, SDRC plans to integrate Camax's CAM technology into the SDRC I-DEAS Master Series product family. SDRC says it will continue to market and support Camax stand-alone CAM products.

GRIDGEN 1.1 FROM POINTWISE

Back to software, Pointwise, Inc., in Bedford, Texas, has announced Gridgen version 1.1, the latest version of its grid generation program. And it's the first Gridgen product to be available outside the U.S. Gridgen 1.1 includes a direct interface to the CFX CFD software program, which gives users the option to set CFX boundary conditions and multiple block grid connectivity directly in Gridgen. For information: (817) 354-1004 or on the Web at http://rampages.onramp/~jrc/pointwise.html.

INTEGRATED PLANT PACKAGE FROM ALGOR, INC.

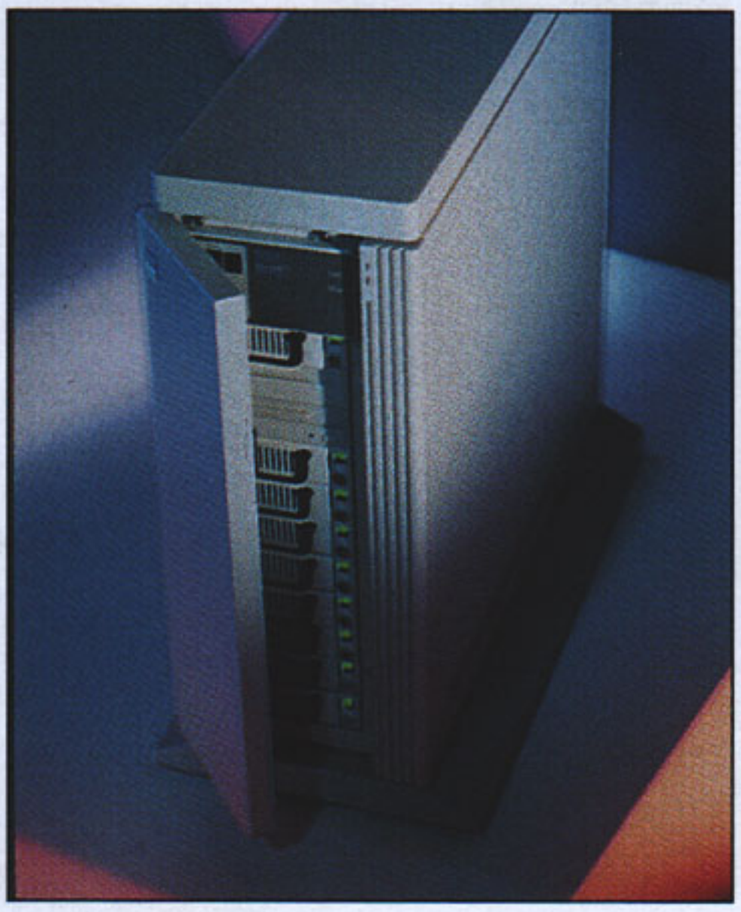
Ducts: Algor Inc., in Pittsburgh, Pa., not to be confused with the vice president of the United States, has released its Integrated Plant Package (IPP) to aid engineers in the design, engineering, and analyzing of piping systems, pressure vessels and heat exchangers. It sounds like something out of the movie



Brazil, where the government controls the maintenance of all piping and duct work. But seriously folks, with this program, plant engineers and pipe stress analysts now have a complete set of tools to analyze and engineer piping systems, pressure vessels and heat exchangers in a variety of industrial applications. "Using IPP enables engineers to design safer piping systems faster and at lower cost," says Michael Bussler, Algor's president and CEO. Where's Tuttle when you need him? For information: (412) 967 2700.

FASTFILEPRO FROM FALCON SYSTEMS

We seem to be heavily populated with software releases this time. So let's not forget about the hardware. Falcon Systems, Inc., in Sacramento, Calif., has rolled out a new line of highly configurable NFS file servers that the company



says deliver industry-leading fast file access to networked UNIX environments. Dubbed FastFilePro, Falcon says the servers combine new network hardware and software technologies in an open, multiprocessor archetecture to break the records for fast file access, price, and performance in the NFS space. FastFilePro boasts throughput of up to 1,300 NFS operations at less than 14 msec access times, using RAID level 5. The system's speed is attributed to its multiprocessor architecture, which incorporates both a powerful 100MHz Pentium processor that is dedicated to NFS file transfer and up to four dedicated PCI RAID processors, which handle all RAID functions. FastFilePro can accommodate individual disk drives and large RAID disk arrays. Including external devices, the servers can allow storage up to 8 terabytes. Prices range from $18,995 to $36,995. For information: (800) 326-1002.

EZ3D VRML AUTHOR FROM RADIANCE

Still on the new releases trail, we turn to Radiance Software International in Mountain View, Calif. Radiance has released what it says is the world's first VRML (Virtual Reality Modeling Language) authoring product for Silicon Graphics workstations called Ez3d VRML Author. The program is great for use with HTML tools to create hot Web pages, but it is also well-suited for prepress, animation, games and stuff like that. Ez3d VRML Author is one of five new products that Radiance announced in January. The company also rolled out Ez3d Modeler Pro, a 3D modeling and raytracing program; Ez3d VRML Composer, for VRML scene composition; Ez3d VRML Render Pro, a program for scene composition for raytracing; and Ez3d Lite, an entry level VRML creation program. "We want to bring 3D to the masses by providing inexpensive, easy-to-use, yet powerful cross-platform 3D authoring tools," says Lee Seiler, Radiance CEO. Ez3d is not just yet another 3D modeler that can output VRML. It is built from the ground up to be a one-stop solution to create compelling, high-performance VRML pages without any hand coding or programming." For information: (415) 943-1313 or on the Web at: http://www.radiance.com/~radiance.

EXTENDED WARRANTEES FROM KINGSTON TECHNOLOGY

Kingston Technology in Fountain Valley, Calif., is celebrating its seventh year making the popular Data Express and Data Silo line of storage products. As part of the celebration, the company is extending its five-year product warranty to seven years. The warranty extension also applies to all Kingston Data Express removable drive carriers and receiving frames, as well as Data Silo SCSI expansion chassis products. For information: (714) 435-2600. ★

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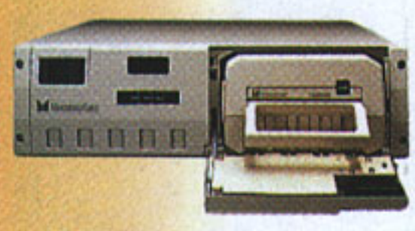

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CIRCLE READER SERVICE CARD NUMBER 42

This Just In....

Good evening, Mr. and Mrs. America and all ships at sea. This just in...One more time we invoke the immortal words of Walter Winchell, the broadcast news pioneer, to open another edition of "This Just In." As you may have guessed, if you've read a few of these columns, I've always been fascinated with media pioneers. That's one of the reasons why I enjoy hanging around Silicon Graphics so much. The work that goes on here is truly transforming what's possible in a variety of media.

Dreamworks: In addition to ILM, Silicon Graphics recently shook hands with another new partner through its subsidiary Alias|Wavefront. Alias|Wavefront is the leading producer of 2D and 3D graphics software for creative professionals. So it's no surprise that Dreamworks SKG, the production company headed by entertainment executives Steven Spielberg, Jeffrey Katzenberg, and David Geffen, selected Alias|Wavefront's PowerAnimator software system to do hot 3D graphics at the company's Dreamworks Digital Studio. Dreamworks bought 14 PowerAnimator systems to work on its first full-length animation film, "Prince of Egypt," scheduled for release in 1998. The Dreamworks Digital Studio is a state-of-the-art production facility that includes an advanced animation system, DAD (Digital Animation Dreammachine), which is supported by Silicon Graphics subsidiary Silicon Studio, with Cambridge Animation and IBM.

Slew o' New Products: January 22 was a big day for Silicon Graphics. The company announced a slew of new products, including new lines of workstations, new CHALLENGE servers, new configurations for creative professionals and souped up versions of the POWER CHALLENGE supercomputing servers. First, the new workstations (frothing at the mouth): Silicon Graphics took the wraps off of the new Indigo^2 Solid IMPACT graphics workstation, which is specifically designed for 3D solid modeling. The machine offers four-times the overall graphics performance for much less money than its predecessor, Indigo XZ. The company also rolled out the Indigo^2 IMPACT 10000 system, the first desktop system to fuse the computational power of the MIPS R10000 microprocessor with the unmatched realism and interactivity of Indigo^2 IMPACT graphics in a 64-bit software environment. It's two to three times faster than the previous Indigo^2 IMPACT workstation. But that's not all. Silicon Graphics dramatically increased its desktop graphics and compute performance with the introduction of the Indy R5000 workstation. It's the first workstation to incorporate the speedy R5000 microprocessor. The Indy 5000 workstation delivers the performance equivalent of hardware-accelerated OpenGL 3D graphics to the desktop. In fact, it delivers 97 percent, that's right, 97 percent faster 3D graphics performance and an 86 percent CPU performance boost over its predecessor for the same price. Along with the Indy R5000 workstation, Silicon Graphics introduced IndyStudio—Indy R5000 workstation specially configured for professionals who do interactive 3D content and digital video and retouch high-resolution images for print, on-line publications, interactive titles, and animated features. The IndyStudio systems are preconfigured with a host of applications, including Alias|Wavefront Composer Lite, Adobe Photoshop and Adobe Illustrator, Insignia SoftWindows and more. Silicon Graphics' new CHALLENGE servers, including CHALLENGE L and XL 10000 (based on R10000), CHALLENGE DM R4400, and CHALLENGE S R5000, deliver twice the performance of their predecessors at the same price. Kawabunga! And the new POWER CHALLENGE 10000 line of supercomputing servers serves up the R10000 processor. It has an expanded system capacity from 18 to 36 processors for a peak performance in excess of 14 GFLOPS.

Cosmo is Here: Just when you thought it couldn't get any better, enter Cosmo. Cosmo is Silicon Graphics' hot new set of advanced development and creative tools to bring cool interactive, multimedia and 3D graphics to the World Wide Web. Cosmo is a complete suite of multimedia development tools that include Cosmo Create, Cosmo Code, Cosmo Player, and Cosmo MediaBase. Cosmo Create is an integrated application for authoring interactive Web pages, multimedia titles, and 3D environments. Cosmo Code is the most advanced professional development environment for the Java programming language, enabling the creation of cross-platform and interactive multimedia applications. Cosmo Player is an interactive multimedia viewer that you can use as a stand-alone browser or as an add-on to your favorite Web browser. Cosmo MediaBase is a new class of media asset management tool that gives Web developers and managers unprecedented capabilities for storage, retrieval, delivery, and management of increasingly complex volumes of multimedia data. Of course they all support the open standards of the Web - HTML, VRML 2.0 and Java. Cosmo is ideal for those folks in content creation, application development, multimedia browsing, and media asset management. It supports cross-platform development, as well as interactive multimedia content deployment across enterprise-wide networks or on the Internet.

Artisans, Explorer, and Enterprise: Silicon Graphics has given developers something to smile about. The company is now offering three flavors of its Developer Program: the Artisan, Explorer and Enterprise Programs. Each program offers a plethora of tools and benefits for developers, including the recently released Cosmo Code development environment, and immediate interactive access to developer resources. Of course Silicon graphics is exploiting the World Wide Web for its developers' benefit. Program members have on-line access to proprietary development tools, including sample source code, development libraries, tutorials and documentation. The Artisan Program is available for folks creating commercially available products for Silicon Graphics UNIX systems. It includes the full suite of ProDev/C++ tools, plus development equipment discounts, dedicated support, and the Developer Rental Program. The Enterprise Program is designed for corporate, academic and research developers, offering Silicon Graphics core development tools and services. Developers of commercial applications, including Internet applications, are eligible for the Explorer program, and may upgrade to Artisan membership. All Developer Program members receive Cosmo Code. For more info, contact Silicon Graphics at (800) 770-3033, or check out the Web site at http://www.sgi.com/Support/DevProg.

So, to sign off with the words of another broadcast pioneer: "And that's the way it is..." — Ken Siegmann

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Introduction to IRIX 4.5 days	May 20 June 3	Jun 10 Feb 5	Jun 10	Jun 17	May 13	May 6
Open GL Programming 1 4.5 days	Apr 15 May 6 Jun 10	May 13	N/A	May 13	N/A	Apr 1
Open GL Programming 2 4.5 days	Jun 24	May 20	N/A	Apr 1	N/A	Apr 22
IRIX IM Programming 4.0 days	Jun 17	N/A	N/A	N/A	N/A	N/A
Real Time Programming 4.5 days	Jun 3	Apr 1	May 20	N/A	N/A	N/A
Parallel Programming 4.5 days	Jun 10	Jun 3	N/A	Apr 15	N/A	N/A
ONYX Maintenance 10.0 days	Apr 22 May 16 Jun 3&17	Apr 29 Jun 17	N/A	May 13	N/A	N/A
MindShare...The Collaborative SGI Environment 2.5 days	N/A	Apr 8 Jun 17	N/A	Apr 8	Apr 22 May 27	N/A
IRIS Performer 4.5 days	Jun 17	Apr 22	N/A	N/A	N/A	N/A
System Administration 5.X 4.5 days	Apr 15&29 May 13&20 Jun17&24	Apr 29 May 13 Jun 24	May 13 Jun 17	Apr 22 May 20 Jun 24	Apr 8 May 20 Jun 17	Apr 15 Jun 3
Network Administration 1 4.5 days	Apr 22 May 6&20 Jun 3&17	Jun 3	May 6	Jun 3	Apr 15 Jun 24	N/A
Advanced System Administration 5.X 4.5 days	Apr 15&29 May 13 Jun 24	May 13 Jun 10	Apr 22 Jun 24	Apr 29 Jun 10	N/A	Jun 17
Open Inventor .5 days	N/A	N/A	N/A	N/A	Jun 10	N/A
ImageVision Library 2.0 days	May 27	N/A	N/A	N/A	N/A	N/A

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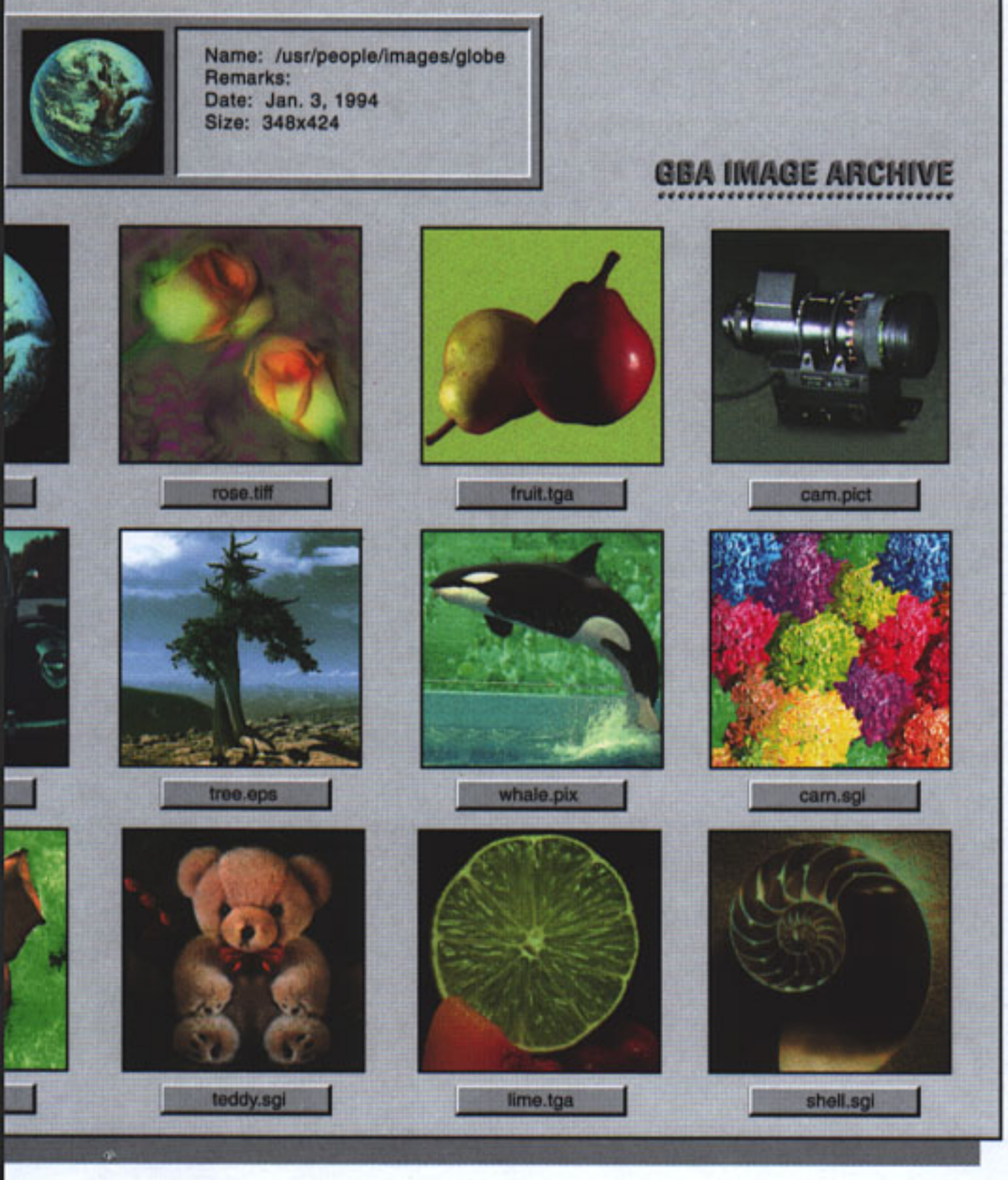

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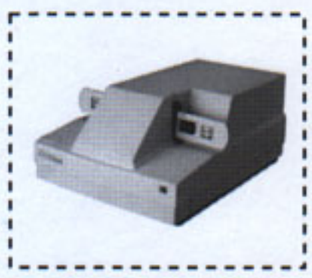

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